

SIXTY-NINTH YEAR

# SCIENTIFIC AMERICAN

THE WEEKLY JOURNAL OF PRACTICAL INFORMATION

VOLUME CVIII.] ★  
NUMBER 20.

NEW YORK, MAY 17, 1913

★ [ PRICE 10 CENTS  
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The present position of the "Lutine" in 50 feet of water. The ship canted over into the excavation made by the pump, after the diver had handled gold bars. The hole is now hidden. An electro-magnet of three tons capacity will raise the masses of metal when broken up by explosives.

THE LATEST PROPOSED METHOD FOR SALVING THE "LUTINE."—[See page 450.]

# SCIENTIFIC AMERICAN

Founded 1845

NEW YORK, SATURDAY, MAY 17, 1913

Published by Munn & Co., Incorporated. Charles Allen Munn, President  
Frederick Converse Beach, Secretary and Treasurer  
all at 361 Broadway, New York

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| Subscription one year   | \$3.00 |
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| Subscriptions for Foreign Countries, one year, postage prepaid                | 4.50   |
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The Editor is always glad to receive for examination illustrated articles on subjects of timely interest. If the photographs are sharp, the articles short, and the facts authentic, the contributions will receive special attention. Accepted articles will be paid for at regular space rates.

*The purpose of this journal is to record accurately, simply, and interestingly, the world's progress in scientific knowledge and industrial achievement.*

## Rothamsted Up to Date

**T**HE sixty years' work of Lawes and Gilbert made the name of Rothamsted familiar to agriculturists the world over, and to-day there is hardly a book on agriculture in which the results attained on that famous experimental farm are not more or less frequently mentioned. Since the death of Lawes, in 1900, and that of Gilbert, in 1901, the work has gone on without interruption, and, in fact, has greatly expanded, thanks to increased funds, including a grant from the British government. The history of the enterprise is traced in the last annual report of the director.

John Bennet Lawes came into possession of the Rothamsted estate in 1834, and at that time began experiments with various manurial substances, first with plants in pots and then in the field. In 1843 he obtained the services of Joseph Henry Gilbert as director, and began more systematic field experiments.

The Rothamsted Experimental Station has always been independent of any other institution, and was maintained entirely at the cost of the late Sir John Lawes during his lifetime. In 1889 he constituted a trust for the continuance of the work, setting apart for that purpose the laboratory (which had been built by public subscription and presented to him in 1855), certain areas of land on which the experimental plots were situated, and £100,000. The management is intrusted to a committee comprising four representatives of the Royal Society, two of the Royal Agricultural Society, one of the Chemical Society, one of the Linnean Society, and the owner of Rothamsted estate.

In 1906 Mr. J. F. Mason, M.P., presented the committee with a £1,000 bacteriological laboratory and funds toward its maintenance. In 1907 the Goldsmiths' Company made a grant of £10,000, the income of which is devoted exclusively to the investigation of the soil. The Permanent Nitrate Committee has also made a grant of £2,000 toward the endowment. In 1904 there was organized a "Society for Extending the Rothamsted Experiments," which has collected donations and annual subscriptions toward the undertaking. Finally in 1911 the Board of Agriculture of the British government announced a plan whereby funds are granted to a certain number of institutions carrying on fundamental research in agriculture, each being designated to receive aid in one great branch of the subject. Rothamsted was selected as the institution for investigations, under this plan, in soil and plant nutrition problems, and received an annual grant of £2,500. Certain agricultural scholarships have also been instituted, the incumbents of which carry on their work at Rothamsted.

The farm has recently been enlarged by the addition of 230 acres of land, on a seventy-seven years' lease, with the aid of a grant of £3,000 from the government and a like amount raised by the Society for Extending the Rothamsted Experiments.

The most remarkable feature of the work at this institution is the continuity of observations made on the same experimental plots over a long term of years. In the words of the director, "Nowhere else in the world do such data exist for studying the effects of season and manuring upon the yield and quality of the crop, and for watching the progressive changes that are going on in the soil."

One illustration of the value of these long series of observations is the way in which ordinary views and experience as to the importance of crop-rotation have been re-enforced. Wheat was grown on the same plots

for sixty-two consecutive years, and the crop yielded at the end of that time only about one fourth as much per acre as wheat grown on similar land for fifty-two years as a part of a four-course rotation. In both cases the land was not fertilized.

## The Cholera Granary

**O**CCIDENTALS hold (theoretically at least) that cleanliness is next to Godliness. Among Orientals, on the other hand, it would seem better to be dirty and holy, than to have clean hands but an impure heart. A step toward the happy combination of personal and religious purity has been taken by the appointment of a commission to inquire into the sanitation of Hindu and Mahometan pilgrimage centers. Here is no doubt a most delicate undertaking, since religious ideas may be involved which the Oriental is likely to adhere to with absolutely unreasoning fanaticism. One need but recall how cartridges greased with pig-fat, which the Sepoy were injudiciously expected to extract with their teeth, precipitated the Mutiny, the Calcutta Black Hole and the rest to realize how ticklish might prove the task of grafting Occidental sanitation upon Oriental civilization. And yet if the cholera and like "scourges of Allah" are not every few years to endanger Europe and the Western World, the Eastern granary from which these pestilences are supplied must be cleared out and closed up.

Though cholera does not disappear entirely in winter its essential bacterium loses much of its virulence during hibernation; the disease is not fairly active until the spring, when it is likely to appear, in Russia, for example, as the Asiatic guest. And by what route does this visitor travel to its destination? One of two: from Mecca to the Mediterranean countries—Greece, the Adriatic, Italy, Marseilles, Northern Africa; and by way of the Caucasus, the Don, the Dnieper, the Danube northward and westward to Vienna, St. Petersburg, the Baltic and to Berlin and the ports whence transatlantic vessels sail. Mecca has, since Mahomet, been in some sort a secondary cholera *entrepot*. It is an epic reflection of history that had Mahomet's hegra been made in the winter rather than in the hot season, millions of human lives would not thereafter have ended prematurely, immeasurable suffering and stupendous material loss would not have come to pass. Awful Mother India has through countless generations fed her children the cholera; especially in the Ganges have they drunk it in and absorbed it, while they have sought to purify their souls in that ghastly stream. Thence have the Asiatic Mussulmans, thus saturated with the cholera vibrio, been making their pilgrimages Meccaward—overland by foot or caravan; or through the Red Sea by sail and latterly by steam; and now also by the Hedjaz Railroad. It is this railway which especially makes Occidental sanitarians anxious; because it is a much speedier route than by caravan or water, and may get its pilgrim passengers to Mecca during the incubation period of the disease, when it may pass unrecognized.

Most of these pilgrims have been and are absolute fatalists, and neither know nor care about sanitary precautions—in the observing which no "merit is to be acquired" (to use Kipling's superb phrase in "Kim"). So these pilgrims have through the centuries been visiting the Prophet's shrine, and have bathed, when they could, in the Holy Wells (it is now forbidden) in order to reach the very pinnacle of holiness; and thus has Mecca become a cholera granary subsidiary only to India. Then European and African Mahometans, just as devout and every whit as fatalistic as their Asiatic brethren, make their pilgrimages into Arabian Mecca; and these pilgrims, by commingling with their fellow-worshippers in the Holy City, have in their own home-coming distributed the dreadful infection to Northern Africa, to Egypt, to Syria and the Mediterranean countries.

## Time and the Sciences

**T**IME and space enter into all our perceptions, and therefore into all scientific observation and reasoning. But not always in the same way, nor with the same emphasis. The biologist of the old school may have been content to collect specimens and to describe them: all this without reference, expressed or implied, to time. A very different attitude is taken by the modern biologist, who centers his interest about problems relating to the development or evolution of the individual and the species—a phenomenon into which the element of time enters very clearly.

Again, it may be safe to say that ninety-five per cent of all published work on chemistry makes no reference to time, and this in spite of the fact that the manufacturing chemist is most vitally interested in the time required for the completion of his reactions. This seeming neglect, which has of course been remedied in the development of physical chemistry, is no doubt due largely to the fact that many reactions proceed with considerable speed, so that the time element, while

important, takes care of itself, as it were, when all other matters have been duly attended to.

In physical chemistry and physics time plays of course an important and well-recognized rôle. But even here there is a limitation. The question is usually "How long?" or "How fast?" Rarely does the physicist ask "When?" In other words, he is interested in intervals of time, but not ordinarily in concrete points of time. This distinguishes the historical from the other sciences, that they do inquire, not merely after the duration or speed of events, but after their date also. The historical sciences *par excellence* are geology and astronomy. Geology is a very special science, devoted to the unraveling of the past history of our planet. As yet it is almost wholly qualitative. The geologist can tell us the order of sequence of events in the past, but as to the length of the periods involved, he is only beginning to obtain crude estimates. With the future he is not, as a rule, greatly concerned.

To the astronomer we look for the most accurate and most extensive instruction in questions relating to time. He is our court of final appeal when we require an accurate standard unit of time. He studies not only the paths and velocities of the heavenly bodies, nor only their history in the past, but foretells with great accuracy coming events. Astronomy is one of the oldest and one of the most highly developed sciences. Its field is the universe, its period the aeons of time.

## Crossing the Ocean in a Flying Machine

**S**OME day the Atlantic Ocean will be crossed by a flying machine—of that those who have followed the development of the aeroplane from its fledgling flights in 1908 to the recent Paris-Berlin trip are fully convinced. Lord Northcliffe's generous offer of a \$50,000 prize for the achievement will bring that day measurably nearer than may be suspected, even though it does nothing more than to arouse a world-wide interest in the performance of one of the most difficult technical achievements that still remains unfulfilled.

When Lord Northcliffe made his announcement, sober-minded engineers naturally asked: What are the difficulties in the way? Can the prize be won? If so, how much will it cost?

As we look back at Wellman's attempt to cross the Atlantic in a dirigible, which was admirably designed and which was by far the best craft of its type built in America up to that time, we are inevitably forced to the conclusion that much preliminary experimenting must be done before a heavier-than-air machine can be sent out on its venturesome transatlantic journey with some hope of success. It would be astonishing indeed if considerably more than the amount of Lord Northcliffe's prize were not expended in these preliminary studies. But even granting that by winning the prize the successful contestant would merely recoup himself, he must inevitably have developed the art so markedly that his craft will have commercial possibilities far greater than those which lie in the mere crossing of the Atlantic. Indeed, the whole problem of devising a safe passenger-carrying aeroplane capable of flying for many hours without a stop will probably be solved. Compared with that, what is a dash across the Atlantic at its narrowest part?

If we were absolutely sure of motors and absolutely sure of the weather for thirty-six hours, a transatlantic flight might even now be attempted from Newfoundland to Ireland. But unfortunately we have no guarantee that a faulty motor will not compel a descent into a choppy sea, and unfortunately the science of meteorology is not so far advanced that we can predict the weather with accuracy for even so short a period as twenty-four hours in advance.

Because present motors cannot absolutely be relied upon, leads to a consideration of the problem of alighting upon a rough sea and ascending from great ocean waves, which has not yet been solved. But the remarkable performances of the hydro-aeroplanes at the recent Monaco meeting prove that the solution of the problem may soon be expected. Seven machines ran out of the harbor into the white-capped Mediterranean and in the teeth of a gale. All but one successfully rose from the surface, flew to Beaulieu, a point some miles down the coast, and alighted again upon a rough sea. What is more, Gaubert's performance in alighting and holding his own in a gale by means of a drag, shows what can be done on the high seas even in a storm.

To be sure, these machines were comparatively light, the heaviest weighing only 2,000 pounds. But the meeting proved conclusively that the large machine of high power is not helpless in heavy seas. In our opinion a flying boat of the Curtiss type is likely to be even more successful than the float type which figured at Monaco. In other words, a boat body in which much fuel, two powerful motors, provisions, and at least two aviators can find room—the very requisite for a transatlantic flight—holds out more promise than any other design.

## Engineering

**Dimensions of the "Britannic."**—It is reported that the "Britannic," which is now being built by Harland & Wolff, will be 887 feet 9 inches in length, 94 feet 6 inches in breadth, with a gross tonnage of between 50,000 and 51,000. Although shorter and narrower than the "Aquitania," the "Britannic" will, according to these figures, be about four thousand tons heavier and will even exceed the "Imperator" slightly in tonnage. The "Britannic," which, according to the original plans, was to be launched next March, will probably be ready to take the water by the end of November of this year.

**A Plant with a 5,412-foot Head.**—Work has begun on a hydro-electric power plant in Switzerland, which will use a water head of 5,412 feet. The water will be taken from the lake of Fully near Martigny in Canton Wallis. What such a head means, we may appreciate when considering that the pipe line will have to be constructed to withstand a pressure of 2,425 pounds per square inch at the lower end. The line will be about  $2\frac{3}{4}$  miles long and the pipe will be from 19 11/16 to 23 5/8 inches in diameter inside, while the thickness will vary from 15/64 to 1 25/32 inches. The upper section will be of the well-known lap-welded type, while the pipes of the lower part will be seamless. The turbines will be of 15,000 horse-power. The plant is being constructed after the plans of Mr. Boucher of Lausanne.

**Cloth Pinions.**—In place of rawhide or paper for noiseless, shock-absorbing gearing, cloth or cotton fiber pinions are now being used with great satisfaction. The cloth is piled up between steel shrouds, subjected to a hydraulic pressure of several tons per square inch, and held in compression by threaded studs passing through both shrouds and filler. The teeth are then cut. The pinion is as strong as cast iron. The teeth are elastic enough to come to a good bearing across the full width of the face. They are not affected by atmospheric changes and are not damaged by contact with oil; in fact they are soaked in oil to exclude moisture and furnish constant lubrication. Such gears have been designed for transmitting from 1/6 to 150 horse-power.

**Machinery Exhibits at the Panama-Pacific Exposition.**—Rapid progress is being made in the construction of the main exhibit buildings at the Panama-Pacific International Exposition at San Francisco. There will be fourteen main exhibit buildings. Work upon the Machinery Building, the largest of the exhibit group, was begun early in the year and it will be ready for the complete installation of exhibits by the opening date, February 20th, 1915. The Machinery Building will have nearly eight acres of floor space. There will also be an auxiliary structure to be known as the Gas and Fuels Building. Electrical machinery, instead of being placed in a separate building, will be located in the Machinery Building and classed under the general heading of machinery. All parts of the building will be served by adequate crane facilities. Electric current, alternating and direct, gas and water, will be available in any portion of the building; compressed air and steam will be provided in a section adjacent to the Gas and Fuels Building. General illumination is to be provided by the exposition company, but a nominal charge will be made to exhibitors for other utilities service they desire. Special rates for power will be made to exhibitors who use it to show machinery in motion. The floor of the Machinery Building is designed for a load of two hundred pounds per square foot. No charge will be made for exhibit space.

**Frozen Coal Shafts.**—It was not until 1883, when Poetsch invented the "freezing method," that Holland's coal fields became of any practical value. The coal is found in the province of Limburg, and, what is more, the two mines near Kerkrade in that province were the very first coal mines operated in continental Europe in medieval times. When, after 1860, the mining industry came to be more seriously considered, and several concessions had been given out by the Dutch government, it was found that the coal layers could not properly be reached, for in every place, except in the two medieval mines near Kerkrade, where coal is encountered immediately under the solid rock, there is a stratum of drift sand that contains great quantities of water. This condition of things made it practically impossible to build the shafts, which had to be of considerable depth, for the coal layers are encountered at a depth of from 300 to 1,000 feet. The freezing method, however, has successfully solved the problem, and Holland now has a flourishing mining industry. On the spot where the shaft is to be dug, from 25 to 30 borings are made down through the drift sand to the solid rock in a circle 5 feet larger in diameter than the projected shaft. Pipes are then sunk into these boreholes, and through these is circulated, by powerful freezing machines, a chemical solution cooled down to minus 20 deg. Cent. In this way the drift sand containing the water is frozen as hard as a rock after the freezing machines have been working day and night for two months. In this frozen cylinder of sand a shaft is then dug and lined from bottom to top with strong segments of cast iron securely soldered together with lead.

## Electricity

**Wireless Licenses.**—During the four months following December 13th, 1912, when the act to regulate radio-communication went into effect, 3,407 licenses have been granted to wireless operators and stations in the United States. Of these 1,185 were granted to amateurs, and 685 amateur stations have been licensed.

**Street-car Ambulances.**—In our issue of April 5th we described a street-car ambulance built in this country for use in Bahia, Brazil. One of our readers has called our attention to a car designed and built after the plans of Dr. Homan, when Health Commissioner of St. Louis, in 1894. Service by this car was inaugurated in December, 1894. Evidently Bahia cannot claim to be the first city to employ an ambulance of this description.

**Electric Searchlight for Airships.**—According to recent information, electric searchlights operated by storage batteries are to be mounted on all the military airships in Germany. An arrangement similar to that employed on warships will allow two airships to communicate with each other by the use of luminous signals. The storage batteries will be mounted in the forward nacelle. Thus equipped it is believed that airships may be employed for nocturnal attacks.

**Free Renewal of Tungsten Lamps.**—We are informed that the manufacturers of tungsten incandescent lamps have decided to reduce the price of lamps after July 1st. A number of the large Edison companies are anxious to place tungsten lamps on the free renewal basis. It is considered probable that the opportunity to do so will be afforded by the reduction in the price of the lamps. This will place the tungsten lamp on the same basis as the carbon filament lamp, with which it is even now a serious competitor.

**Ozone and Pine Trees.**—What is the reason that pine and fir trees, and others of the species, are surrounded, more than other trees, by ozone, and that therefore forests of the "needle-leaved" trees are so health-giving? If the theory of Prof. Lemstrom, of Helsingfors, is correct, this can now be explained; for the "needles" act on the atmosphere as generators of electricity, so that the trees are always surrounded by electricity and consequently by ozone. Prof. Lemstrom began his researches in this direction by studying the uses of the spikes or "beards" of grain (wheat and rye) which he found to be generators of electricity which the plant requires for its proper development.

**Arc Versus Spark Waves.**—The recent radio-telegraphic tests conducted between the scout cruiser "Salem" and the Arlington station have demonstrated that waves produced by the electric arc are less modified by absorption than waves produced by spark apparatus. Up to a distance of about nine hundred miles there was very little to choose between the two types of waves. It was possible for the Arlington station to reach the "Salem" at a distance of 2,100 miles. But as the distance was increased over two thousand miles, it was found that the waves produced by the electric arc showed a relatively increasing efficiency and possessed an energy much greater than those from the spark apparatus.

**Cadmium Vapor Lamps.**—The mercury vapor lamp would be ideal were it not so deficient in red rays. It has been found that by operating the lamp at much higher temperatures in a quartz tube there is an increase in the emanation of red rays as compared with green and blue rays. But even under such conditions the light it gives does not possess enough red for ordinary commercial purposes. Efforts have been made to find a vapor which will give the desired spectrum. However, the desired end has now apparently been reached by Dr. Wolfke, who uses cadmium in the lamp. The vapor of cadmium gives an excess of red light when the temperature of the lamp is raised, but this is corrected by adding a small amount of mercury. It is stated that a lamp of 3,800 candle-power uses 620 watts.

**Meters on the Back Porch.**—The railroad town of Renovo in Pennsylvania has adopted the very convenient scheme of placing electric-light meters on the back porches of the houses. In fact, most of the houses are provided with cupboards on the back porch to receive the electric meter. The advantage of this arrangement is that it permits the meter reader to read a great many meters in a day for the reason that he does not have to enter the house. It is a common matter to read 300 meters in a single day. Another advantage is that the meter is placed in a conspicuous place where the consumer may read it from time to time and get better acquainted with it. Much of the trouble over lighting bills is due to the fact that the consumer very seldom reads his meter, so that he is surprised at the end of the month if his bill is larger than usual, whereas if he had watched the meter day by day he might have been able to determine the reason for a sudden increase in the amount of electricity consumed by recalling that on the previous night the lights were burned unusually late or a stormy afternoon made it necessary to turn on the light earlier than usual. Perhaps the principal advantage to the consumer of the back-porch meter is that his house need not be invaded by the meter reader every month.

## Aeronautics

**A 500-mile, Non-stop, Cross-country Flight.**—On May 1st aviator Eugene Gilbert, on a Morane monoplane, made a non-stop flight of 513 miles from Paris to Vittoria, Spain. After resting and refilling his tanks, Gilbert continued for some distance, but finally descended at Medina del Campo, where he broke some of the guys of his monoplane in making a bad landing. The time of this flight was 8½ hours, which is the record for a non-stop cross-country flight.

**A Thousand Miles Across Country in 22 Hours.**—After a close call from death because of pneumonia, Ernest François Guillaux, a young Frenchman famous for his many flights over Paris, made a trip to Biarritz in his Clement-Bayard monoplane. Leaving Biarritz at 4:22 A. M. on April 27th, this record-breaking youth flew to Bordeaux and thence to Villacoublay, where he made a second stop for replenishment and continued on his flight. He descended the third time in Kollum, Holland, before dawn on the following day, having covered over 1,000 miles in less than 24 hours.

**A Record Flight from Paris to Berlin.**—In the competition for the Pommery Cup for the longest flight across country in a single day, Pierre Daucourt, on a 50 horse-power Borel monoplane, covered the 555 miles between Paris and Berlin in 8 hours and 44 minutes flying time, or at an average speed of 64 miles an hour. The start was made at 5:06 A. M., and Liege, Belgium, 211 miles away, was reached in 2½ hours, or at an average speed of nearly 85 miles per hour. About 60 miles per hour was averaged from Liege to Hanover, Germany, and 50 miles per hour from Hanover to Berlin. As stops some two hours in length were made at Liege and Hanover, the total elapsed time of the flight was around 13 hours, which is excellent when one considers that Andemars required two days in which to make this flight last August. This Swiss aviator, on a Morane monoplane, left Villacoublay 15 minutes before Daucourt started, in an attempt to beat the French pilot. He covered the 130 miles to Mexieres at 87 miles per hour, and, resuming the flight, crossed the Ardennes at a height of 6,000 feet, and finally landed at Wanne, in Westphalia, at 11:30 A. M. after battling with a very strong head wind throughout the last 60 miles. The next day he abandoned the flight because the wind still continued.

**The First Flight Across the Isthmus.**—After several attempts to fly across the Isthmus of Panama by well-known aviators, it remained for Robert S. Fowler, the second man who flew across the continent of North America, to accomplish this difficult 40-mile flight. Fowler arrived at Panama on April 11th with an 80 horse-power Gage hydro-aeroplane and a cinematograph and man to operate it. The next day he made a ½ hour flight above Panama and took moving pictures of the city. After flying over the canal as far as the Pedro Miguel locks and back in the second of two flights made on April 25th, Fowler flew across the Isthmus the whole way above the canal two days later. He started at Panama beach at 9:45 A. M. and, after circling to gain altitude at the entrance to the canal, he headed direct for Colon. Encountering a 25-mile breeze at Colon, Fowler continued toward Cristobal, but his motor stopped for lack of gasoline and he landed in shallow water. The pontoon of his hydro-aeroplane was slightly damaged. This flight has been several times attempted by leading aviators, but all gave it up because of no chance of alighting on the way, and also because of the air currents in the Culebra Cut.

**Constructing Machines on a Scientific Basis.**—The Royal Aircraft Factory in Great Britain undertook last year a series of experiments on full-sized aeroplanes, with a view to improving their efficiency and stability. These experiments were carried out in conjunction with aerodynamical researches at the British National Aerodynamical Laboratory. After calculating the results that would accrue to two different machines in the laboratory, various changes suggested were made to these machines, and the result was well nigh remarkable. With a Farnham biplane, fitted with the same horse-power motor as before, an additional load of 82 pounds was carried as against 80 pounds that laboratory calculation showed should be carried. In addition to this there was an increase of speed of from 37 miles per hour to 47.5, an increase in flexibility or speed variation of from 35 to 37 miles per hour to from 33 to 47.5 miles per hour; an increase in load of 10 per cent; an increase in climbing ability of 100 per cent; a very great increase in stability and ease of control; and a very great increase in total efficiency. The improvements in the Government biplane BE2 were very marked indeed. Whereas in the Military Aeroplane Competition last fall it was supposed to maintain an air speed of over 55 miles an hour, to climb at the rate of 200 feet per minute, to fly fully loaded for three hours, to glide at an angle of 1 in 6, to be capable of landing at 40 miles per hour, and to have a range of speed of 15 miles per hour, the results actually obtained were 72 miles per hour, 480 feet per minute, 5 hours, 1 in 8, 40 miles per hour, and 32 miles per hour respectively.



Stairway for use of the blind guiderail in the center for ascent and descent.



Section of fire escape and stairway leading to roof playground and running track.



Blind men in the bowling alley find the play an excellent form of pastime.

### Training the Sightless

By Walter L. Beasley

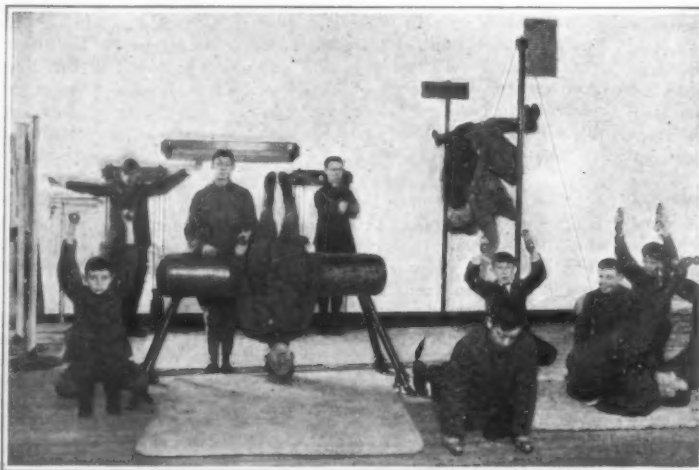
THE New York Association for the Blind, in the completion and opening of its new building, 111 East Fifty-ninth Street, has produced the most perfect plant for the manual, educational and social training of the blind in America, or probably in the world. The structure is fittingly termed the "Light House," being dedicated for the exclusive benefit and welfare of those who live in eternal night. In fact, the opportunities here offered to enable those who are without sight to conquer darkness by learning practical handicrafts, thereby making them self-supporting as wage earners, mark a new era for the emancipation of the blind, industrially and intellectually. As complete isolation from the world is now recognized as one of the chief terrors of blindness, and blindness without opportunity is the worst kind of slavery, one of the principal objects the new structure is designed to serve, is to give the independent blind men and women an opportunity to be self-helpful, and again to take their places in the work and play of the sighted world.

To teach the blind, therefore, actual accomplishments in various fields of usefulness, is the main purpose of the institution. The "Light House" is a five-story, modern fireproof building of brick with stone frontage. It represents the last word in interior construction and equipment for the development of the physical welfare of the blind. One of the distinctive building features is a combination fire escape with wide stairways and guiderails, provided also with open air platforms, affording roomy space for tables, chairs, etc. Each floor leads out into one of these open galleries, so that at will any activities can be carried on in the fresh air during the summer months. The architect was Mr. William Welles Bosworth. The accompanying illustrations show some of the unique interior and exterior features of the building adapted to meet the requirements and convenience of the blind. The first floor is devoted to a large weaving and assembly room, with a gallery above. This is filled with a beehive of industrial workers, where many looms are operated by the skillful and ingenious blind women. Here various articles of handicraft are turned out. Weaving and the work in basketry have been developed to a high standard. Articles that are made by the blind can stand competition and usually surpass in excellence similar ones made by the seeing, while draperies, with as many as six different colors, woven in patterns, are successfully turned out by the "Light House" weavers. There is perhaps distinction in this blind work from the fact that the artisans are all able to execute, without supervision, after a reasonable apprenticeship, all the processes required in their industries. The blind girl threads her loom, which sometimes has as many as four hundred threads, prepares her own material, fastens it to her own shuttle,

and weaves the article, including the pattern. The only assistance which she gets is the direction as to what colors she is to use and what design she is to follow. The second floor is an attractive salesroom, where are displayed and sold to the public the various articles made by the blind, such as furniture, carpets, rugs, woven articles, curtains, draperies, cushions, laces, embroidered portfolios, bags, card cases, baskets, etc. In the rear is located the museum, which contains interesting exhibits representing the industrial, educational and pictorial progress of the blind, from the past to the present. The third floor is occupied by the general and special offices, and class rooms for the teaching of adults and children. Here is also located the census and registration room, containing a list of over ten thousand names of the blind in greater New York who have been investigated by the association. This work is in charge of Mr. W. I. Scandlin, who, before losing his vision, was a well known editor and authority on photography. One of the most noteworthy and essential features in the building is the thorough arrangements provided for physical training and

recreation. This it appears is more vital to the sightless than to the seeing. The gymnasium, having an experienced instructor, himself partly blind, is fitted with all the latest apparatus to strengthen their users' bodies and to stimulate their wits. The accompanying illustration shows a typical animated scene on a Saturday afternoon, when a squad of blind boy scouts are doing some of their exercises. The "Light House" scouts were selected by Sir Robert Baden-Powell to be his honor guard at the great rally given to him by the Boy Scouts of America. Probably the crowning feature, bringing the greatest appreciation and joy to the young blind people, is a spacious roof garden forming an ideal playground for roller skating, drills, games and dancing in the open air. This also has additional attractions, in fact, a decided innovation in city buildings, in the shape of a wide, concrete running track. This occupies a half section of the roof, and the sightless runners find much amusement in getting around the track in real sportsman-like fashion. In the basement there are installed other important features for the development of the physical welfare of the blind, a

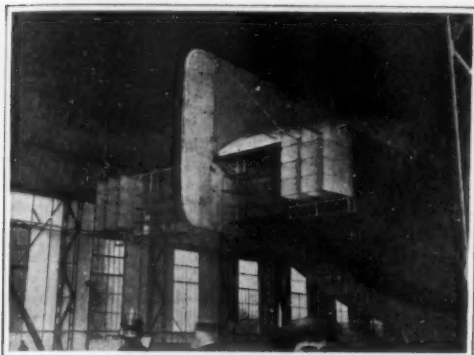
large swimming pool, numerous baths, and a bowling alley. A bowling club meets weekly, and this exercise is recognized as a most excellent form of pastime for the blind. One of the accompanying pictures shows a detail of a much-frequented stairway leading to the basement and the guide railing employed for the person ascending or descending. Sharp angles and corners are avoided, and this same idea is carried out in all stairways, walls, closets, vestibules, etc., in the building. The New York Association for the Blind is a philanthropic society, supported entirely by voluntary contributions. In the half dozen years of its existence it has accomplished important and far-reaching achievements for the progress of the blind. It secured legislation and the co-operation of health boards, medical associations, etc., for the prevention of blindness. It helped to place the first blind children in the public schools of New York; now there are 160 in attendance. It secured an amendment to the education law, making the education of blind children compulsory, so that they are no longer forced into ignorant and helpless lives, or compelled to become beggars or drudges. It published the first magazine for blind children in this country, *The Searchlight*, printed in Braille. In many other ways it is coping with the problem of blindness and doing continuous helpful and uplifting work in behalf of the blind world. The president of the association is Dr. John H. Finley, with Helen Keller as one of the vice-presidents. Winifred Holt, the secretary, is especially interested, devoting her time, service and gifts to the welfare of the blind and directing its numerous activities from the "Light House" headquarters. Among the influential members of the practical advisory board is Hon. Thomas P. Gore, the young blind United States Senator from Oklahoma.



Blind "Boy Scouts" exercising in the gymnasium.



Blind boys taking exercise on the roof running track.



The multiple-bladed horizontal and vertical rudders.

## A Journey in a Zeppelin

Impressions of a Trip in the Airship "Viktoria Luise"

By Carl Dienstbach



Working the nose of the airship into the shed.

IT is the absolute novelty of the sensation that renders it impossible to imagine beforehand just how it feels to journey through the air in the ideal comfort and with the safety and speed which characterize a Zeppelin airship.

The sensation is a combination of the distinct impressions; the bigness, complexity and self-sufficiency of this new world of yours, its complete detachment, and finally, its mighty powers.

Balloons, aeroplanes, smaller airships, cannot impress one so strongly. Their cramped quarters and moderate dimensions do not suggest such a "world in itself." Their progress is not so certain. They have the jarring and jerking characteristic of earthly locomotion. But in a Zeppelin one feels as if one were on another planet, circling through space on its prescribed course. One loses the sense of speed, and at times might think himself still hovering in mid-air, were it not that the picture below keeps on changing as frequently and quite as softly and smoothly as the floating fancies of a dream.

In the cabin there is complete absence of vibration and noise; for the hum of propellers and motors is as subdued as the rustling of trees and the softest speaking voice is distinctly audible. The motion would suggest the drifting of a spherical balloon were it not that the mind is very quickly impressed by the fact that it is not as aimless. Only when something in this floating panorama below tries to remain, do you realize, with a start, the amount of "brute force" (nearly 500 horse-power) that keeps your dream going.

If you see the locomotive of an express train with the piston rods vibrating to and fro, gradually falling behind with its tail of waving handkerchiefs on a track that runs parallel to your course, you feel a sudden respect for the driving power of the great propellers fore and aft.

Later a flight of pigeons appears at a lower level, also going in the same direction. They hold their own only for a while—until they turn from our course. In the cabin the air is not at rest. A fitful little breeze, just enough to remind you that you are flying, comes in occasional puffs through the windows, but even outside the air is sucked along by the huge hull, and does not blow against the extended hand with a force corresponding to the ship's velocity. But a hurricane sweeps into the exposed front car. The pilot of an aeroplane meeting the "Viktoria Luise" would behold the unusual sight of a man at the helm in the uniform of a naval sailor wearing automobile goggles. Recently a transparent windshield has been fitted to the "bridge." The crew of the big passenger Zeppelins last summer was partly composed of naval sailors and officers being trained to man the huge new airship of the navy. The peculiar character of the cabin, which on earth drew from almost every visitor to the shed the simple exclamation, "A dining car," appears only after the airship has ascended. After landing it seems to shrink again into insignificance; but a thousand feet up in the air it feels as roomy and as gorgeous as a palace.

The passengers are housed as in an apartment. The aluminium gangway is folded against the wall, opposite the door through which you pass in entering the ship. In front you see the steward's little pantry, with a door opening into the long passageway to the front car and to the machinery and steering devices.

Looking up upon entering you "see heaven" through an "endless" tube, made of canvas and aluminium rings. Closer

inspection reveals a double flight of ladder steps fitted against the tube's wall. A short aluminium ladder is also strapped to the side of the passageway that can be locked to the lower end of the tube to complete access to the observation platform (practically a small deck) on top of the hull.

At the rear end of the cabin you pass again through a door to a floor of ribbed aluminium plates. Its right corner serves as a wash room, its left corner is partitioned off for the wireless telegraph. In the center another door opens into the rear passageway—an endless vista, reaching beyond the rear car to the hindmost point of the hull, where a man may climb through one of the round, canvas-covered portholes, and out over the frames of the rudders and stabilizing planes to make repairs, a thousand feet above the ground. An engineer is always sent to this porthole shortly after the ship has got under way to inspect the working of the rudders. A narrow path of ribbed aluminium, carried on low steps, forms the floor of the passageways.

In the shed the cabin looks a poor protection against the weather; of the six large windows on each side, the three in the rear are gaping holes. Those in front have such neat and practical panes of "cellon," that if necessary the rear ones could be at any time equally protected. But when the airship ran into a drenching rain there was not a trace of dampness or discomfort in the cabin. Looking through the paneless windows, one might see whole sheets of water blown to the rear, but the wide overhang of the hull above, and the speed of the ship, never permitted a side gust to blow any

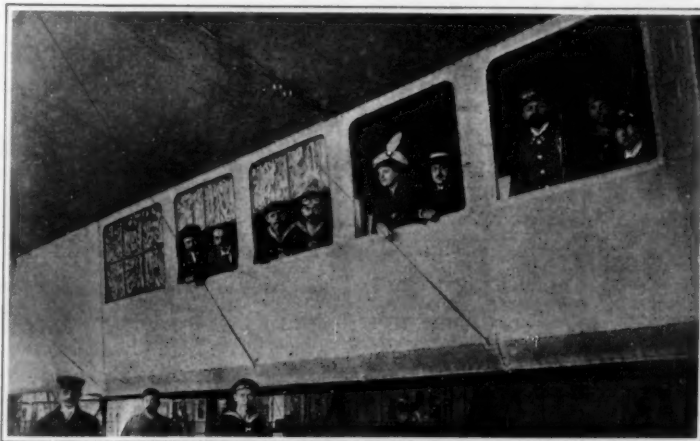
rain toward the windows. To notions acquired in houses or in railroad cars or ships, the airship's cabin seemed protected by magic. It was a pleasure to walk through its length and to think that it was virtually "walking on air."

There is so much room that the upholstered willow chairs seem hidden on the sides and never in the way of people passing each other. It was thrilling to hear a footstep far back in the "hold," hear a door open, and then see an engineer from the rear car, in damp oil-cloth, emerge through another door and continue on his way to the front car to report at the "bridge."

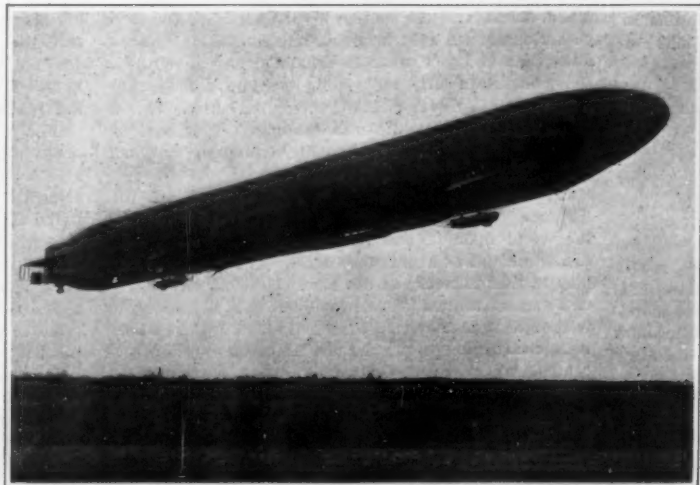
There was a coming and going of sailors (aerial apprentices), who complained how nerve-racking the "dreadful responsibility" made even their short shifts at the "wheels" (in an airship there is more than one helm). The strangest sensation, after all, was the "cruise in cloudland." It was a stormy morning; on the way to the air harbor, heavy showers poured against the windows of the street car. The clouds were hanging low, torn into fantastic and beautiful shapes of all shades between black and white. After ascending, the airship was directly among them; several times it ran into them, and all became gray outside and a peculiar odor was noticeable. When we emerged it was uncanny to see the dark masses float by at the level of the ship. But the cabin felt so homelike that any feeling of fear or dizziness was out of the question. Wonderfully reassuring was the fact that one had a "roof over one's head," even a beautiful mahogany ceiling.

The sunlit landscape, seen from not too great an altitude, and from a swiftly-moving observatory, was an experience so novel that no comparison will give a true idea of it. It is different from the view from a mountain, because most objects are so much nearer, while from a tower or a skyscraper the lower altitude makes the field of sight comparatively limited. But the determined swift movement of an airship gives the vista the same depth as from a high mountain, yet things appear so much more distinct. The result of this and of the entire lack of such experience is a truly bewildering richness of vision, quite beyond the mind's power to grasp. The most familiar scenery appears disguised to beyond recognition. Well known buildings are the most useful clues to identification; then rivers, ditches, ponds and roads. Forests, trees, hills, the outlines of towns, help but little. In an airship one realizes for the first time how little we see in everyday life. Everything is pitilessly laid bare; secrets seem stripped stark naked. We fly over a village; it is still misty, and we pass it quickly. Yet during these few seconds we can make an excellent guess at the fortunes of each inhabitant. We take in all the telltale marks about a stable and learn the number and condition of the stock inside. There is no hiding in a forest, the ground is distinctly visible between the trees and through the branches. If the air is clear enough to use a strong field-glass, the same applies to war times and high levels of flight, the one necessary condition being that the line of sight approaches the vertical.

The airship's freedom from any fixed line of travel, except among high mountains, has a very unusual effect. The country through which this trip extended was quite familiar to the visitor, yet the airship took him for the first time to two never-visited cities around Frankfurt, which were touched on the "airline" as a matter of course, and just as easily as the



All aboard and ready to cast off.



Gliding along easily with the speed of an express train.

other ones where he had been. Even with present high fares, airship travel pays well for the foreign tourist who wants to get acquainted with a country. He sees as much of it in hours as otherwise he could get in weeks.

### The Hydraulic Ram

TO most people an hydraulic ram is a mystery. As a matter of fact, it is the most simple and efficient mechanical device for raising water by water power. This is probably what makes it seem so mysterious to those who have never seen a ram at work.

Pumping water by hydraulic ram makes a water-supply system far superior to any other except a gravity system. In some instances it is even better than gravity in matter of expense when a gravity supply requires a long line of pipe. A windmill must depend on the wind; a gasoline engine means continuous attention and expense for fuel; an hydraulic ram costs nothing to operate, requires no attention, depends upon nothing but the source of supply.

Hydraulic rams are not only adaptable for pumping water for household purposes, but they can be used for delivering large quantities of water for irrigation, town water works, railroad tanks, etc. Where the least possible expense must be incurred for pumping water for any of these purposes, there is naturally a great demand for rams. This applies particularly to irrigation, as it enables the farmer to raise crops at a minimum cost per acre.

Hydraulic rams can derive the power for operating them from a spring, brook, flowing artesian well or river; and if the ram can be located at such a point that a constant stream of water can be supplied to it through a pipe having an incline or fall of three or more feet in a given distance, the conditions being such that the power water which escapes at the ram can be drained away, it is possible for the ram to deliver a steady stream of water to a point at an elevation thirty times the difference between the levels of the ram and the water supply. This stream of water, once started flowing, will continue without interruption, day and night, winter and summer, requiring no attention nor expense except for the renewal of rubber valves on the ram once every year or two. This is a trifling expense, as the valves cost but little.

The efficiency of a ram can be very great, reaching, under favorable conditions, 80 per cent or more. This means that the ram will pump more water to the same height than any other kind of engine which pumps water by means of water power.

The amount of water that may be pumped per day by such a ram is remarkable. It will pump as much as a quarter of a million gallons a day. If a delivery of two million gallons a day is required, a "battery" of rams can be installed. That is, two or more rams are placed side by side.

Where pneumatic pressure tanks are used instead of gravity tanks, rams will not only supply the water, but also maintain the air pressure up to 100 pounds, as may be desired.

### The Current Supplement

HOW long has the ocean been in existence? This seems a difficult question to answer, yet it is possible to make a fairly good estimate of the age of the ocean, as is shown by F. W. Clarke in this week's issue of our SUPPLEMENT.—Mr. R. D. Andrews has made a study of the comparative efficiency of Eiffel aeroplane surfaces, which he reports in this issue.—The new Löttschberg Railway, which opens this month, and on which the most powerful electric locomotives of Europe will be in service, is described.—I. S. Stone gives a valuable survey of the facts known regarding the propagation of high-frequency currents along wires.—C. H. Butman discusses the origin of the native American Indians, on the basis of recent investigations in Siberia.—A very striking example of protective mimicry is afforded by the coloration of certain butterflies, as is shown in an excellently illustrated article by the Rev. F. Bennett, M. A.—Mr. Charles H. Clark discusses the cycle of his gear engine.

**Extending the Erie Canal to Chicago.**—Writing in the current issue of the *National Waterways Magazine*, Representative Cyrus Cline, of Indiana, suggests that by canalizing the Maumee River from Toledo to Fort Wayne, a distance of 120 miles, and then cutting through a fairly level country along the shores of Indiana to some point in Lake Michigan, a distance of 120 miles more, the Erie Canal can be extended to Chicago. This would provide a direct waterway of sufficient size to float heavy freight from Chicago to New York and eastern cities without reloading. It would cut off 850 miles from the existing circuitous round rip between Chicago and Toledo via Lake Michigan, the Straits of Mackinac, Lake Huron, the Detroit River and Lake Erie. He asserts that the Erie Canal without the assistance of trade by this direct route to Chicago will not carry ten per cent of the freight it is capable of floating.

### A Copper El Dorado in Mid-Africa—The Katanga

By Charles Fitzhugh Talman

AS the leading copper-producing country of the world the United States may soon have a formidable rival in a region that was a few years ago an unknown and trackless wilderness.

Not long since the SCIENTIFIC AMERICAN called attention to the fact that American map-publishers had not yet discovered the existence of the flourishing German seaport of Tsingtau, on the China coast, founded about a decade previously as the administrative center of the colony of Kiaochau. In consequence of our editorial of March 11th, 1911, subsequent editions of American atlases have remedied this particular oversight; without, however, seeming to realize that our criticism applied generally to the amazing "out-of-dateness" of American, as contrasted with European, productions of this class.

Just as the publication in 1910 of a large-scale map of the China coast minus Tsingtau was an enormity, so the publication in 1912 of a large-scale map of Africa minus the Katanga is a characteristic piece of ineptitude on the part of our compatriots. Such a map now lies before us. In conspicuous type it bears the legend "Copyright, 1912," while in an obscure corner, in very inconspicuous type, is the real date of the greater portion of the map, viz., 1895. In view of the latter date it is not surprising to find that the Katanga—whose name has been one to conjure with in the mining circles of the world for the last three or four years at least—is still known to the cartographer as "Misisir Kingdom." The atlas in which this map appears sells



Sketch map of the Katanga.

Railways built ——— Under construction - - - - - Several other lines are in contemplation. Elisabethville, the capital of the district, is destined to become one of the important railway centers of the world. It is already in direct railway communication with Cape Town, 2,300 miles distant. The hatchings show regions in which agricultural studies have recently been carried out by an official mission.

for fifteen dollars. As the geographical works at the disposal of most of our readers may be equally defective, we present herewith an up-to-date map of the Katanga.

The Katanga is the southernmost district of the Belgian Congo. Its area is approximately 180,000 square miles, and its population is estimated at one million. Being mainly a lofty table-land, it enjoys a temperate climate and in this respect appears to be better adapted to colonization by white men than any other part of tropical Africa. It is abundantly watered, and has unlimited agricultural resources.

It is, however, the vast mineral wealth of the Katanga that has recently focused the attention of the world upon it, and has already attracted capital to the amount of about \$50,000,000. The natural corollary is that not only is the Katanga itself on the eve of being intersected by railways, but it is attracting to it the great trunk lines of the continent, and will soon be a clearing-house for the commerce of southern and central Africa.

Even the most makeshift maps of Africa will show you the seaboard terminals of these lines; Benguela on the west; Mombasa, Dar-es-Salaam, and Beira on the east; and Cape Town on the south. From Benguela a railway is now rapidly pushing across Angola, and will probably connect up with the Katanga system in a very few years. As soon as the latter system extends to the

shores of Lake Tanganyika, it will be in communication by water and rail with the Indian Ocean ports of German and British East Africa. Already the trunk line from Cape Town has entered the Katanga from the south. By next October it is expected to reach Kambove, and next year it will probably be extended to Bukama. From the latter place steamers already ply on the River Lualaba to Kongolo; thence a railway extends to Kindu, whence there is steam and water communication to the mouth of the Kongo River.

Thus the time is measurably near at hand when Elizabethville, the capital of this flourishing region, will be regarded as the railway center of Africa. This town, which has sprung up over night, and whose population is about 1,300 Europeans and some 10,000 natives, already boasts of numerous comfortable hotels—the principal of which are ambitiously styled the Cecil and the Carlton—public buildings, clubs, and even moving-picture theaters. The value of the buildings erected there last year amounted to \$1,350,000.

While gold, tin and diamonds are all mined in the Katanga, the all-important product of the country is copper. Its potential wealth in this mineral is said to be almost fabulous. According to G. B. Beak, late British vice consul at Elizabethville, the southern copper belt extends 200 miles, with a breadth of 35 to 60 miles; i. e., about 7,000 square miles of territory. Quoting from a South African newspaper: "The ore bodies are of enormous size. At one mine a cross-cut at the 100-foot level is 437 miles in length, and for 50 feet or more the ore averages 30 per cent copper. This mine alone is estimated to produce 30,000 tons yearly. Even allowing for the cost of transport, these supplies should be available on the European market at less than \$150 a ton. The road is at last cleared for the full development of the great Belgian Congo copper belt, there now being nothing to prevent the southern portion of the Katanga from becoming another Rand, with Elizabethville as a worthy rival to Johannesburg."

The smelting problem has been provisionally solved by the shipment of coke from Rhodesia, but coke furnaces are about to be installed in the Katanga.

### Salvaging the "Lutine"

By Percival A. Hisslam

THE SCIENTIFIC AMERICAN has already dealt at some length with the attempts to salvage the valuable cargo of the British frigate "Lutine," which was sunk on the night of October 9-10th, 1799, off the Dutch coast with ten tons of specie on board. When the vessel was wrecked—only one man being saved—she had in her holds 1,900 bars of gold and 500 bars of silver, of a total value of \$6,035,000, and in the two previous and rather primitive attempts to get at this (in 1801 and 1857-9) the divers succeeded in getting up the precious metal to the total value of just over half a million dollars.

For the last two years the National Salvage Association of London has been working on the wreck, and Capt. Gardiner, who is in charge of the operations, has every hope of being able during the coming season to raise enough of the specie to pay the speculators a very handsome profit. The wreck is actually the property of Lloyd's. In the first place, it was claimed by the Dutch government, and a company for its salvage was formed in Holland. In 1823, however, the King of Holland made a gift of the vessel to the King of England (George IV.), by whom it was transferred to Lloyd's, who had lost \$4,500,000 on the insurance of the wreck. The Dutch salvage company still exists and has some sort of claim on whatever may be recovered, while Lloyd's, the present owners, considered salvage totally impossible. The company now engaged on the work is to pay 15 per cent of what is recovered to Lloyd's and another 15 per cent to the Dutch company, retaining 70 per cent for itself.

During 1912 the work was considerably impeded by bad weather, and although the salvage vessel "Lyons" was out for eight months it was only possible to put in 278 hours of work as compared with 836 hours in the previous year. Nevertheless, the work that was done was most effective, and Capt. Gardiner is confident that if the conditions in 1913 are at all favorable a large quantity of the treasure will then be brought to the surface. In July last one of the divers found a fair sized hole in the bottom of the vessel, and, on putting his arm through, was able actually to touch the gold bars and to give an almost accurate estimate of their size (they are 7 inches long, 2½ inches wide and 1¼ inches thick). Unfortunately, owing to the removal of the sand from under the bottom, the vessel had canted over when he went down again, the hole being entirely covered.

One of the greatest difficulties with which the salvors have had to contend is the strong current which runs over the wreck. The tides there have a circular motion, and the effect of tides and of strong currents in conjunction was to render abortive all efforts to keep the wreck uncovered and easily accessible by divers. To overcome this trouble a deep channel has been cut,

roughly a mile in length, the "Lutine" lying in about the center. The wreck lies between the islands of Vlieland and Terschelling, which are in the island fringe surrounding the Zuider Zee, and the effect of cutting the deep channel is to give the currents a clear run from the Zuider Zee into the North Sea, and vice versa, with the result that the channel is kept comparatively clean by currents that run at from 3 to 7 knots. Over 1,500,000 tons of sand were removed in this work, one effect of which has been to increase the depth of water over the wreck from 14 feet to 50 feet. The vessel now lies on a hard clay bottom—so hard, indeed, that a 4-ton gun lying on it has not been able to sink in at all, while a 5 horse-power drill was unable to penetrate more than three feet.

When the matter was last dealt with in the SCIENTIFIC AMERICAN a description was given of a novel device invented by Mr. Simon W. Lake, of Bridgeport, Conn., which had been brought to the notice of the salvors as likely to be of assistance to them in their work. It may be described as a long, flexible tube, in which divers would be able to work for a much longer time than usual, and in greater comfort. While there is no doubt that this arrangement would be of considerable value in less troubled waters it is impossible to use it in connection with the "Lutine," owing to the strong currents that have to be contended with, as well as the heavy swell which runs in from the North Sea.

The principal difficulty remaining to be dealt with is presented by the enormous masses of rusted shot and ballast in which the specie is embedded. It must be remembered that the vessel has been lying at the bottom of the sea for 113 years, and that when the bars were taken on board they were placed in the shot rooms under the ammunition, which has become rusted together. During the operations of 1857-9 a diver found a mass of Spanish dollars four feet thick, but was unable to touch them owing to their great weight, and the same misfortune attended the success of another who, a few years later, found a solid pavement of silver bars and rusted iron twelve feet square.

When operations are renewed early in the coming spring the "Lyons" will have on board an electric lifting magnet with a lifting capacity of three tons. The masses of metal will be broken up by means of small charges of explosive into pieces small enough for the magnet to deal with. The magnet, supplied by a firm of Birmingham, Eng., has already proved successful in similar work. One of these magnets was recently used in a London dock, which threatened to become choked up owing to the accumulation of scrap metal, and by its agency about 90 tons were removed in five days. Several other dock companies have now adopted the contrivance, one advantage of which, in the case of the "Lutine," is that it will be possible for a diver to be down while the magnet is working, this being, of course, quite impossible while a powerful sand pump is operating. The magnet will be of the ordinary lifting type, but with special arrangements made to insure its being watertight.

The magnet will be worked from a jib-crane on board the "Lyons," which is an exceptionally large vessel for the work on which she is engaged. She is 198 feet long and 28 feet in beam, with a displacement of 537 tons and engines of 1,650 horse-power. She is equipped with one 20-inch sand-pump, having a capacity of 1,500 tons an hour, and two 12-inch pumps of 380 tons capacity each. She is fitted with blacksmiths', carpenters' and engineer-fitters' workshops, has an electric search-light enabling work to be continued day and night, and carries a crew of forty-seven. A telephone communicates between the divers and the deck of the vessel.

Capt. C. A. P. Gardiner, who is in charge of the operations, has been occupied in salvage work for a quarter of a century, and has over 120 successful cases—and not one failure—to his credit, so that if anyone can succeed on the "Lutine" he is certainly the man. Perhaps his most interesting "case" occurred at Cadiz, where he happened to be with his salvage vessel when a Spanish merchant ship, bound from the Barbadoes to Barcelona with sugar, ran aground by the bows. Salvage was offered and accepted, the terms being \$45,000. Having satisfied himself that the bulkheads of the stranded ship were watertight, Capt. Gardiner took his vessel alongside and proceeded to flood the fore hold. It may perhaps be excused that the Spanish skipper did not understand this maneuver, but he had no excuse for thinking that the salvors wished to sink his ship, or for chasing Capt. Gardiner round the decks with a loaded revolver, as he did. He was, however, got under control, put in irons, and placed in the chart room. When sufficient water had been pumped into the hold a powerful steam-pipe was introduced, and before long what had been sugar was a lake of fairly thin treacle. It was a simple matter to pump this out, and the ship, being sufficiently lightened by the bows, was easily floated off in under twelve hours, undamaged.

The bell of the "Lutine" is hung in Lloyd's buildings in London, and is rung whenever a wreck is "posted."

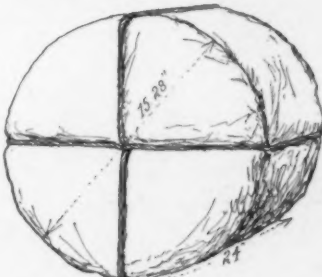
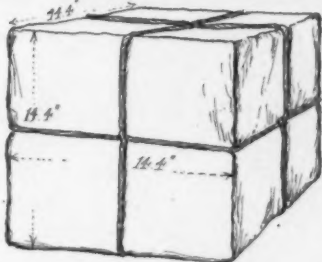
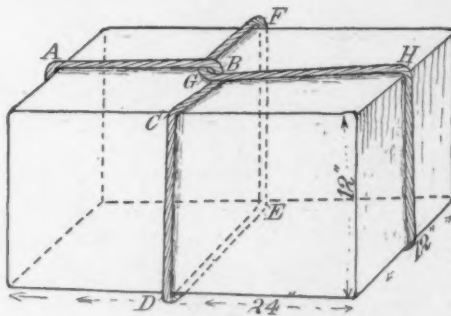
## Correspondence

[The editors are not responsible for statements made in the correspondence column. Anonymous communications cannot be considered, but the names of correspondents will be withheld when so desired.]

### The Maximum Parcel

To the Editor of the SCIENTIFIC AMERICAN:

Under Section 15 of the Parcel Post Regulations, if a parcel exceeds "seventy-two inches in length and girth combined, it must be refused, no matter how small the excess may be." In another paragraph of this same Section 15 the measuring of "combined girth and length" is explained by saying that "in measuring the length the greatest distance in a straight line between the two ends of the parcel shall be taken, while the girth is the actual measurement by a tape encircling the parcel at its thickest part."



Largest packages of different shapes allowed by Parcel Post regulations.

Under these provisions strictly interpreted a rod 72 inches long would have to be infinitely thin to be accepted; and a perfect cube would have to be not more than fourteen and four tenths inches high, because the girth of such a cube is 4 times 14.4 or 57.6 inches, and its length 14.4 added to the girth 57.6 makes 72.0 inches exactly.

The 14.4-inch cube contains  $14.4 \times 14.4 \times 14.4$  or 2,985.984 cubic inches; and the 72-inch rod contains zero or no cubic inches; and a question that naturally arises is, have we any form between the thin rod and the cube that will enable the shipper to send a still greater number of cubic inches under the rule?

In a rectangular package the square cross section is the most advantageous, so that the problem may be stated in the following form: What should be the dimensions of a square bar whose combined girth and length is 72 inches, in order that such bar shall contain the greatest number of cubic inches, and how many cubic inches will it contain?

Let  $x$  inches be the width and thickness of this bar, so that its girth will be  $4x$  inches. Its length under the rule will be  $(72 - 4x)$  inches. The cross sectional area is  $x^2$  square inches and the volume  $V$  is  $x^2 (72 - 4x)$  cubic inches. We may, therefore, write:

$$72x^2 - 4x^3 = V$$

and note that  $V$  should be as large as possible or a maximum.

Differentiating for the maximum we have:

$$144x - 12x^2 = dV/dx = 0$$

whence

$$x = 12.$$

We, therefore, have: girth, or  $4x$ , equals 48 inches; length, or  $(72 - 4x)$ , equals 24 inches; cross section, or  $x^2$ , equals 144 square inches; volume, or  $24x^2$ , equals 3,456 cubic inches.

This represents a gain of approximately  $3,456 - 2,986$ , or 470 cubic inches, which amounts to very nearly 16 per cent, and the package has the advantage of being of a form that is much more conveniently handled than the cube.

The dimensions of this package to recapitulate are 12 inches by 12 inches by 24 inches. It is represented in the annexed rapid perspective, where the combined girth and length is the full length of the string  $A, B, C, D, E, F, G$ , and  $H$ .

A cylinder of the same length, 24 inches, and, therefore, of the same girth, 48 inches, would have a diameter of  $48/\pi$ , or 15.28 inches, and a volume of almost exactly 4,400 cubic inches.

The sphere of all solids is known to be the one that incloses the greatest volume within a given superficial area; but the largest sphere that could be sent through the mails has a diameter  $d$  equal to  $72/(\pi + 1)$ , or 17.38 inches, with a volume  $V$  equal to  $1/6$  of  $\pi d^3$ , or 2,749 cubic inches. Under Parcel Post Regulations, therefore, the spherical form of package, which can only be considered as a matter of curiosity, is even less advantageous than the cubical.

A point not to be overlooked is that in any case the weight limit of eleven pounds must not be exceeded.

Arlington, Va.

JOSEPH BECKER.

### The Levee Question

To the Editor of the SCIENTIFIC AMERICAN:

About twenty years ago, on the occasion of examinations of old Mississippi River pilots on the question of whether a piece of land was an accretion or island, I took advantage of the opportunities to discuss with them the question whether the levees raised or lowered the bottom of the river. It was their opinion that they raised the bottom and would eventually cause the bottom to be higher than the land at the sides. It seems to me that if the levees increased the current to the extent that the water carried with it the silt, it would be a mass of mud before reaching New Orleans. The theory of opening up through headlands and allowing a straight course to the sea as a panacea has an objection in that it would cause such a current that the river in its course would pick up much more silt on account of its force. Should such a course be pursued, the river would probably be unnavigable on account of the current; then, also, the effect of such a current against a bank would be disastrous. Should not the river be allowed to follow its natural course, spreading out over and enriching and raising the level of the land along its borders on certain occasions? Would it not be better to learn to use the land according to the laws of nature and not to struggle ineffectually against them?

The question of leveeing, when near me the years I lived in the Mississippi Valley, raised the legal question in my mind as to whether the levees could be legally built, in view of the fact that they changed the natural course of the flow and raised the water of other land, and at the time the question of whether or not the building of levees on the Arkansas side of the river, raising the flood level in Tennessee, would not be stopped by injunction issued in the Federal Court.

Mobile, Ala.

GEORGE B. CLEVELAND, JR.

### Forth and Clyde Battleship Canal

To the Editor of the SCIENTIFIC AMERICAN:

With reference to the notice of the above project in your issue of March 29th last, permit me to point out through your correspondence columns, that the British government has promised state aid to the project on certain conditions. (See page 1 of the accompanying reprint of the engineer's lecture to the Royal Scottish Society of Arts on January 31st, 1910.) The altered strategical conditions under which the home battle squadrons of the British fleet are now placed have rendered the construction of the ship canal an imperative necessity, and the question is now mainly one of terms between the treasury and the canal promoters. I would further point out that the ship canal would be of the utmost commercial importance to the maritime traffic passing between the New World and north central Europe.

MAJOR CHILTON L. ADDISON SMITH.

Edinburgh, Scotland.



View toward the village of Gampel and the Rhone valley.

## The Lötschberg or Bernese Alpine Railway

Modern Engineering for the Benefit of the Tourist

By Dr. Alfred Gradenwitz

SINCE the granite wall of the Alps was first pierced thirty years ago, in order to lay through the St. Gotthard range a railway on which Italy, the land of poets and artists, could be reached more comfortably, numerous railways and tunnels have been created by the art of engineers and the enterprise of capitalists. The St. Gotthard tunnel, 14 kilometers in length, has long been outdone by the Simplon tunnel, and the most gradiose schemes in bridge and viaduct construction have been realized in connection with the new Bernese-Lötschberg-Simplon Railway, to be inaugurated during the current month, which combines with the most daring technical structures an abundance of surpassingly beautiful scenery, to an extent never approximately afforded by any other railway line. The Lötschberg line leads through the Bernese Alps from Frutigen to Brigue, in the Rhone valley, and links up, on one hand, the country round the Lake of Thun, Berne and Interlaken; in fact, the Bernese Oberland, with Upper Valais, the Upper Rhone valley—especially with the magnificent mountain and tourist center of Zermatt and Saas-Fee—and on the other hand, through the directly-connected Simplon tunnel, with the splendid Lago Maggiore, the Borromean Islands and the industrial and traffic center of Upper Italy, Milan, Turin and Genoa.

But the Bernese Alpine Railway is also of international importance, offering as it does to travelers from Germany to Italy a route in every way equivalent to the St. Gotthard line, which affords the additional advantage of a perfect absence of smoke, due to the adoption of electric traction.

In fact, this is the first Alpine railway of more than local importance for which electric traction has been planned at the outset. The daring spirit in which it was conceived is the more to be admired as at the time of its inception no technical appliances able to comply with the extraordinary demands of the occasion had yet been evolved. Thanks to the initiative of the railway company, these means have now been created by the construction of

*Switzerland's great industry is to cater to the tourist, and in this endeavor all modern resources are strained. The current month sees the opening of another most picturesque railway line, connecting Lake Thun with the Simplon tunnel. Interest in Swiss travel is so general that we feel sure our readers will welcome an account of the new line. Those who seek more detailed information will find it in this week's issue of the SCIENTIFIC AMERICAN SUPPLEMENT.—EDITOR.*



Luegelkinn viaduct, 123 meters long; five 20-meter spans; height, 50 meters.

locomotives more powerful than any steam locomotives in Europe, and the first section from Spiez to Frutigen has been converted into a trial line for these new engines. The speed of the trains, in spite of the high gradients of the line, which are equal to those of the St. Gotthard, Arlberg and Mont Cenis routes, exceeds the figures reached on these lines. In order to illustrate the power of the new electric locomotives, it may be said that each of them can draw a train weighing 310 tons on a gradient of 27 per mile, which is the international standard fixed as a maximum, whereas in the case of steam traction two powerful engines are required for the same performance. The Bernese Alpine Railway comprises the lines of Thun-Spiez-Frutigen-Kandersteg-Brigue and Spiez-Interlaken-Bönigen; the company also runs steamships on the lakes of Thun and Brienz. The Simplon tunnel, which has been open to traffic since 1906, is also operated by electricity.

The starting point of the Lötschberg or Bernese Alpine Railway is at Spiez, on the Lake of Thun, where it connects with the Lake Thun Railway. After passing a short tunnel through the Hondrich, it enters the Kander valley beyond Spiez. At Mülenen is effected the transfer to the electric cableway leading to the wonderful Belvedere of Mont Niesen (7,755 feet). After Reichenbach, the intermediate station for the Kien valley, with its wealth of Alps, Frutigen, until now the terminus of the line, is reached.

The new line of Frutigen-Brigue, after crossing the Kander, rises slowly up the mountain slope on a high viaduct, and at Blau See describes a large double loop, partly in a loop tunnel. Travelers thus see the romantic ruins of the Felsenburg castle at first above, then beside, and finally below themselves. Before reaching Kandersteg, the railway runs alongside the Kander Falls. Throughout the journey the traveler's eye is fascinated by the iceclad mountain giants, Altels and Balmhorn, Rinderhorn, the Doldenhorn, peaks of Blümlisalp, the bold colossi Birre and Fislstöcke, all of which encompass the

lovely health resort of Kandersteg. The Lötschberg tunnel, 14,605 meters in length, pierces the Fisistücke, passing below the Gastern valley and the Lötschen pass, in order again to emerge at Goppenstein. Farther uphill, the Lötschen valley, dominated by the huge Bietschhorn, opens out into a gorge of delightfully genuine Alpine character, which, like few others, has been so far left practically untouched by the tourist traffic. The Bietsch gorge is crossed on a most picturesque iron bridge, comprising a main span of 317 feet and two side openings, each of 149 feet.

At Hohen, the railway enters the Rhone valley, where the marveling eye of the traveler enjoys an incomparably beautiful view of the valley reaching to 1,400 feet below, the wonderful mountain outline on the south of the valley and the numberless brown villages and cottages with here and there the white church steeples. Somewhat gradually it then makes its way down to Brigue, crossing on numerous grandiose viaducts the northern affluents of the Rhone, and piercing in twenty-one tunnels the projecting rocky rib of the mountains. The view enjoyed in the vicinity of Ausserberg, on Visp, lying far down in the valley, and the mountains of the Nicolai valley, the Nadelhorn and Taschhorn, is of surpassing beauty. From Brigue the Federal Railway trains take the traveler in a few minutes to Visp, where the cars of the Visp-Zermatt Railway bound for the grand glacier and peak regions of Zermatt and Saas-Fee are waiting for him, whereas in a northeastern direction the mail road passes through the Goms and the quaint villages of Upper Valais, in order, at Gletsch on the Rhone glacier, to connect with the Grimsel and Furka passes. Straight on, in a southeasterly direction, the electric locomotive, however, takes him through the longest tunnel in the world, the Simplon tunnel, 19,803 meters in length, to Domodossola, to the wonderful shores of Lago Maggiore, and farther on, to the flourishing cities of Upper Italy, Milan, Turin, and Genoa.

The line from Spiez to Brigue is 48.48 miles in length and reaches its highest point (4,100 feet) in the middle of the Lötschberg tunnel. It opens up new districts of Switzerland to human traffic and gives access to countless jewels of the Alpine world.

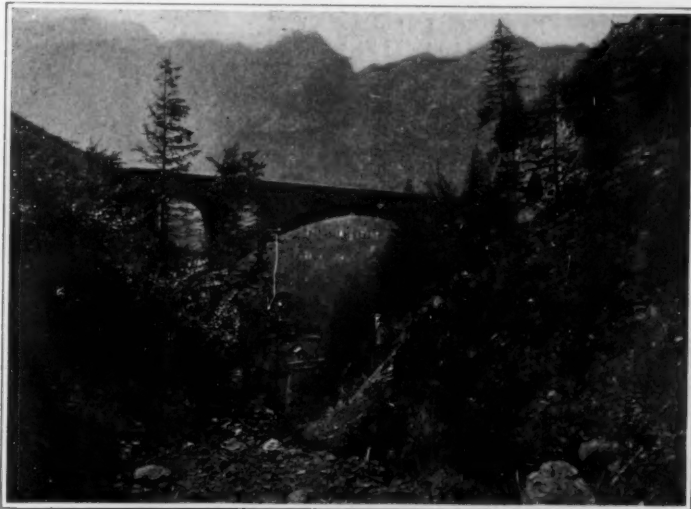
### The Smithsonian Institution and the Aero Club of Washington Celebrate Langley Day

IN commemoration of the work of the eminent pioneer of the air, the late Samuel Pierpont Langley, secretary of the Smithsonian Institution, 1887 to 1906, the Institution and the Aero Club of Washington united on May 6th, 1913, in celebrating the seventeenth anniversary of the first aeroplane flight, that of Mr. Langley's model steam aerodrome No. 5, which twice flew successfully over the Potomac River at Quantico, Va., May 6th, 1896.

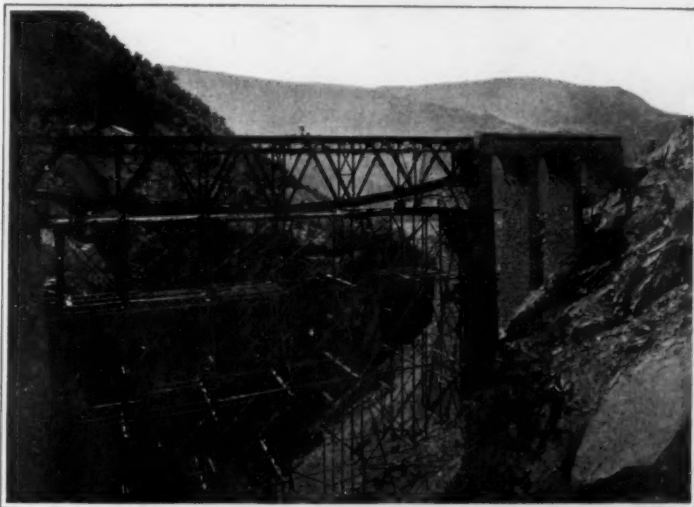
The first part of the exercises took place in the main hall of the Smithsonian Building at 2:30 P. M., when the Langley tablet was unveiled, and the Langley medals awarded to Mr. Glenn H. Curtiss and Monsieur Gustave Eiffel for experimentation and progress in the science of aerodynamics. Addresses were delivered by Dr. Alexander Graham Bell and Dr. John Alfred Brashear of Allegheny, Pa. Owing to the absence of M. Eiffel, his Excellency the French ambassador received the medal in his behalf.

The second part of the celebration was held at 4 o'clock on the grounds of the Army War College, and consisted of a reception by the Aero Club, followed by hydro-aeroplane maneuvers.

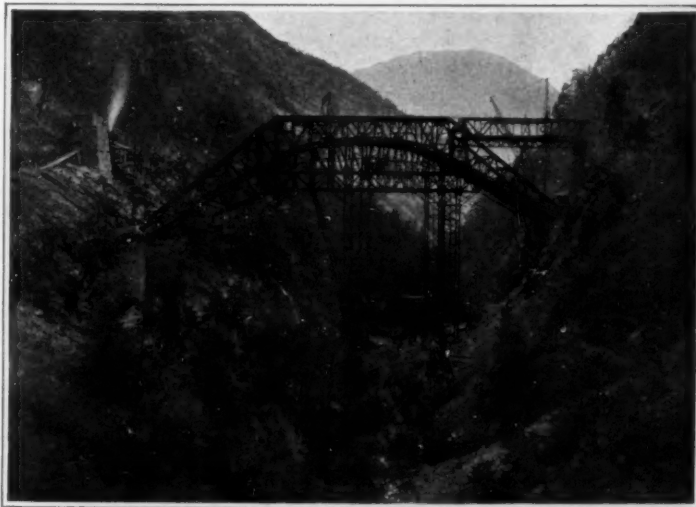
Although Mr. Langley's first successful aerodrome was only a model, it has been accorded the place of the first ship of the air, since it was without doubt the first heavier-than-air machine to fly, propelled by its own power. Many years of incessant labor, repeated discouragements, and



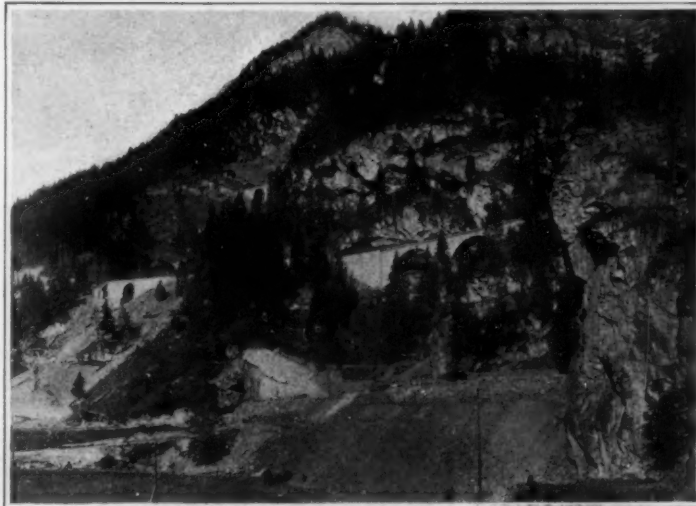
Bridge above Mittholz.



The Baltschieder Gorge viaduct.



Bridge over the Bietsch Gorge.



View showing three railway lines above one another.

much public misconception, were encountered before Mr. Langley achieved his purpose and demonstrated to the world the practicability of mechanical flight. The success attending his experiments with steam models in 1896 led him to continue his work in perfecting his gasoline models, known as the quarter-sized models, which also flew successfully, and he then undertook, for the War Department, the construction of a steel man-carrying machine, which although practically perfect in every point, failed to fly during the two trials held in 1903, due to a defect in the launching apparatus. This excited the ridicule of the press and the public, which neither understood the real cause of the accident in the launching apparatus nor appreciated that such a Government experiment must be conducted in secret; and what was an accident was termed a failure. Mr. Langley was discouraged and nearly heart-broken, and never again attempted to fly the large machine, which is even to-day the peer of its kind, both in its lines and construction, and its remarkably light and powerful gasoline engine. This machine and the various models that preceded it are safely housed in the Institution, where they were built.

When the Wright brothers had made their successful experiments they remarked that the inspiration of many of their early studies and much of their enthusiasm emanated from the work of Mr. Langley. People then began to study his researches seriously and were not long in realizing the great importance of the principles which he had discovered and the data which he had assembled. They recalled with regret the disparagement they had offered by untimely criticism.

In 1911 the Aero Club of Washington planned to celebrate the event of the first flight of a machine heavier than air by exercises held annually on the 6th of May, which was to be known as Langley day. The third celebration of this event was a fitting tribute to Mr. Langley and his sincere efforts toward establishing a new science.

In commemoration of Mr. Langley's researches in aeronautics, the Board of Regents of the Smithsonian Institution caused to be prepared an oblong tablet of bronze, measuring four feet six inches high by two feet five inches wide, cast from a design by Mr. John Flanagan. It represents the late secretary seated on an open terrace watching the flight of birds, while at the same time he sees in his mind's eye his aerodrome soaring high above them. The tablet bears the following inscription:

Samuel Pierpont Langley  
1834-1906

Secretary of the Smithsonian Institution  
1887-1906

Discovered the relations of speed and angle of inclination to the lifting power of surfaces moving in air.

"I have brought to a close the portion of the work which seemed to be specially mine, the demonstration of the practicability of mechanical flight.

"The great universal highway overhead is now soon to be opened."—Langley, 1901.

The Langley medal was established by the Board of Regents on December 15th, 1908, in memory of Secretary Langley and his contributions to the science of aerodynamics, "to be awarded for specially meritorious investigations in the science of aerodynamics and its application to aviation." The Wright brothers were the first to receive this medal in 1910, when it was awarded to them "for advancing the science of aerodynamics in its application to aviation by their successful investigations and by their successful demonstrations of the practicability of mechanical flight by man." As already mentioned, the medal was conferred this year upon two other investigators, Mr. Glenn H. Curtiss, the well-known American aviator, and Monsieur Gustave Eiffel, the eminent French student of aerodynamics and aviation.

## Thinking Horses

A Problem in Animal Psychology, or in Stage Trickery?

By the Berlin Correspondent of the SCIENTIFIC AMERICAN

THE first duty of the scientific investigator is to record his observations. Explanation must follow after. Ordinarily this principle hardly requires emphasis, but when the observations recorded are marvelous to the degree of being well nigh incredible, it behooves us to consider the facts first and hold in reserve our opinion as to their significance.

The reports which we have heard for some time past of horses that read, do sums in arithmetic, and even spell out spontaneously their "thoughts," would probably be utterly ignored by scientific men, were they not—at least in part—authenticated by persons of unquestionable authority and integrity. As it is, we must accept the facts, whatever their meaning may be.

It will be remembered that some years ago a certain Herr von Osten astonished the world by the performances of his horse, "Der kluge Hans," which at the time were accepted by some eminent men of science as giving evidence of remarkable reasoning powers of the equine brain. Then came destructive criticism, seemingly crushing criticism, from Dr. O. Pfungst, who claimed to have demonstrated that the horse took his clue for his replies to questions set him, from signals given—no doubt involuntarily—by his master. Thus, if the horse were stamping out a reply—so many beats of his hoof—his master would, when the right number was reached, give indication of the fact by an involuntary gesture. Dr. Pfungst's criticism seemed well founded, though perhaps to some it may have seemed that a horse who would react to such slight indications was almost as clever as one that could read. However this may be, the matter was not to be disposed of thus lightly.

Newspaper notices on Herr von Osten's horse had aroused the interest of Mr. Karl Krall of Elberfeld, who, though a prominent business man, had always taken an active part in scientific and psychological problems. When in May, 1905, after the publication of Dr. Pfungst's negative certificate, public interest in Clever Hans seemed to have definitely vanished, Krall went to see Herr von Osten and his pupil and volunteered his collaboration in the task of disproving the adverse criticism of the acknowledged representatives of psychological science. Special precautions were taken, which seemed to preclude any possibility of signaling, yet the horse worked his problems as well as before.

In order to ascertain whether Hans' accomplishments were the outcome of exceptional capacities or of normal equine intelligence, Krall then purchased two young Arab steeds, Muhamed and Zarif. The instruction of these horses commenced on November 2nd, 1908, and was carried out in a simplified and rational manner, on the main lines of von Osten's method, but with some modifications to avoid certain defects. According to von Osten's method each figure was indicated by a corresponding number of beats of the hoof. Krall taught his horses to indicate the tens with the left and the units with the right hoof. After only three days' teaching the horses were able to recognize the first figures, 1, 2, 3, written on the board, touching with their mouths the number pronounced by the teacher. After 10 days Muhamed could count as far as 4. Some days afterward his teacher explained to him the significance of the tens and the use of his left foot in striking the tens and of the right in marking the units. On November 14th, i. e., 12 days after the first lesson, Muhamed did correctly a whole series of simple sums:  $1 + 3$ ,  $2 + 5$ , etc., and even subtractions, such as  $8 - 3$ . On November 18th, Mr. Krall proceeded to teach multiplication and division, and on the 21st, fractions and sums of fractions. In December,

Muhamed learned some French and was now able to solve his tasks in arithmetic both when enunciated in French and German. In the month of May of the following year Muhamed could extract square roots, cube roots, and solve all sorts of complex problems, which seemed to exceed the powers of human arithmeticians, apart from calculating prodigies.

In February, 1909, commenced the reading or spelling lessons. A conventional alphabet, in which each letter or diphthong is represented by a figure inter-

mediary between 11 and 66, was used in this connection. Zarif was thus able, after four months' tuition, of his own accord to spell any words pronounced before him, even though he had never seen them written. A rather peculiar fact is that both horses would, with the greatest obstinacy, cling to phonetic spelling, which they would vary on different occasions in a manner which seems to show that they were really seeking to render the sound of the word. The word *Pferd* (horse), pronounced approximately *pfaird*, was, for instance,

spelled on different days in the following different ways:

By Muhamed.—*bfert*, *bfrt*, *färd*, *fert*, *frt*, *faürt*, *faerd*, *faert*, *färb*, *fpferd*, *frrt*, *pärd*, *pfärt*, *ppferd*, *pfer*, *pferd*, *tfert*, *fed*.

By Zarif.—*bfert*, *färd*, *färd*, *ffert*, *ffert*, *pfride*, *sdfert*, *pfert*, *bffert*, *fdacrp*, etc.

The following account of a "conversation" held with the horses in the presence of Dr. Hermann Dekker may serve to give some idea of the remarkable claims made for the thinking horse. Muhamed happened to be ill, being lame on one hind leg. The veterinary surgeon, Herr Mittman, had just called and had prescribed water compresses, which Albert, the groom, had to put on. Dr. Dekker was introduced to Zarif in the following manner: "This gentleman is also a doctor, like Dr. Mittman, who called yesterday to see Muhamed. However, he is a doctor for men and not for horses." After half an hour's calculating and spelling exercises with Zarif, the horse was asked "Do you still know the gentleman's name?" and Zarif telegraphed in his own code "Dgr," which is the correct equivalent of Dekker. "What is the gentleman?" "Dgtr." "Is there not a letter missing?" "O." "At which place?" "2."

A short time ago Krall added to his party of thinking horses a pony called "Hänschen" and a blind horse "Berto." The results obtained with the latter are especially remarkable. The horse being in addition devoid of any sense of smell, could only receive outside impressions through the ear or his sense of touch, both of which were found to be highly developed. As the animal moreover turned out to be remarkably gifted for "arithmetical" exercises, he after a week or two was able to do any simple addition, subtraction, multiplication or division read out to him or written on his skin.

In view of von Osten's sad experience Krall refrained for some years from making the results of his work public and has only recently told the story of his horses in a book called "Thinking Animals (Denkende Tiere); Contributions to Animal Psychology on the Basis of Personal Experiments." This publication aroused a sensation throughout the German scientific world and even abroad, two camps being soon formed of enthusiastic supporters and obstinate opponents respectively. A number of prominent psychologists have submitted the horses to a strict examination, without, however, reaching any final conclusion.

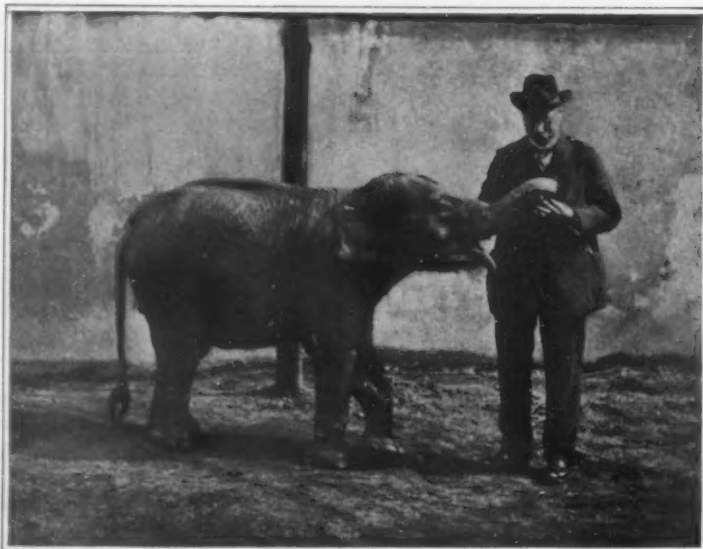
Such are the accounts of some of the remarkable feats reported from the repertoire of these "learned" horses. And what are we to think of them? It will be wise to reserve our opinion for the present. But a criticism offered by M. Quinton is much to the point. He draws attention to the remarkable fact that these horses extract square and cube roots with apparently the same facility as they do simple additions and subtractions. This seems to indicate clearly, according to M. Quinton, that the performance depends on some trick or unconscious collusion between the master and the horse. That it is possible for a human being of ordinary arithmetical faculties to perform the feat of such root extraction at sight was demonstrated by the same M. Quinton in our issue of April 19th, 1913, p. 354.



Mr. Krall and his thinking horses: Zarif on the left and Muhamed on the right.



Zarif is having his lesson in spelling.



The latest addition to Mr. Krall's animal school.

### Scrap Heap of French Machinery at Panama

SOME idea of the operations of the French at the Panama Canal, and their lavish outlay for machinery, may be had by looking at the accompanying photograph. This hill of junk collected at Mount Hope consisted of French machinery which has been rusting for years and wasting away in the damp tropical climate. An enterprising house-wrecking company of Chicago has purchased the material from the Isthmian Canal Commission and is now gathering it and turning it into scrap to be shipped to the United States. Over forty thousand tons have been brought to Mount Hope. But this represents only a part of the material yet to be collected, the quantity of which cannot be estimated accurately. Included in the pile so far recovered are twelve abandoned ladder and construction dredges. Already some of this material has been loaded on a steamship and transported to this country. The miserable heap tells a pitiful story of ruined hopes and ambitions caused by official mismanagement and grasping treachery.



"Bleaching bones" of French endeavors at Panama.

### Machine for Testing Files

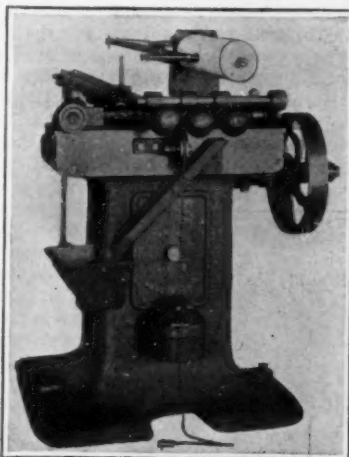
LIKE the proverbial pudding, the proof of the file is in the eating. In order to determine the value of a given type of file, it is necessary to know how long and at what rate it will eat into a test piece of metal. A machine has been constructed which will put a file to this test. The file is held between two head stocks mounted on a reciprocating table, whose stroke can be varied from nothing to six inches. One of the head stocks is provided with a handwheel and screw for adjusting the file with its working face parallel to the direction of motion. The file is drawn back and forth against the end of a test bar, which is pressed upward by means of a weight and chain. Thus a constant pressure is given throughout the cutting stroke. On the back stroke provision is made to withdraw the bar in order to prevent useless wear of the teeth, and to reproduce as far as possible the operation of a good mechanic in using a file. The machine carries a recording drum on which is a sheet of section paper. The drum is geared to revolve slightly with each stroke of the file, one inch of its periphery representing ten thousand strokes. Connected to the test bar which is filed away, is a pencil which moves longitudinally across the drum as the bar is filed away. The result of the continued movement of the drum and the pencil is a curve which shows what the file was doing at every instant of the test. The test is continued until the teeth of the file are so dulled that they cease to cut.

### Paris Motor Garbage Truck

THE street cleaning department of Paris has been thoroughly "automobilized." Motor sprinklers flush the streets, motor sweepers brush the dirt to one side, and motor refuse wagons cart away the garbage of the householder and the sweepings of the streets. Only a few months ago a special commission, appointed by the city of Paris, made a thorough test of a new type of motor refuse truck in front of the Hotel de Ville. The commission laid great stress upon the fact that the transportation of refuse material must not be accompanied with dust. Consequently, the vehicle had to be completely inclosed. The last truck tested by the commission is illustrated in the accompanying two engravings. It is an electrical vehicle of great carrying capacity. The principal feature is the hermetic closure of the body. The covers are movable on rails.

### Ship-cleaning Brush

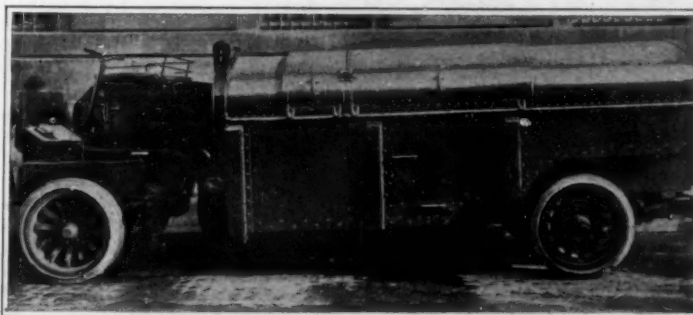
HITHERTO, when it was necessary to clean the hull of a vessel, the vessel has had to be put in drydock to enable the workmen to remove the marine growth



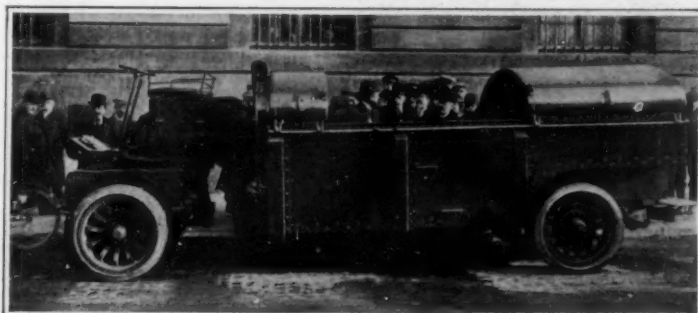
Testing the life of a file.



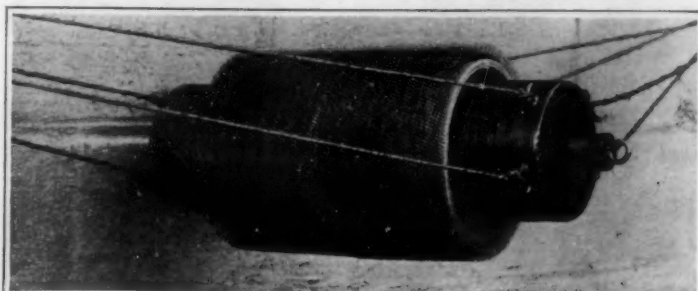
The largest single leaf bascule bridge.



Paris' electric garbage truck; the body hermetically closed.



The motor garbage truck being inspected by a commission.



Electrically-driven brush for cleaning ship hulls.

by hand. Such treatment is necessary very frequently, particularly in tropical waters, but owing to the difficulty and expense of putting the ship in drydock it is apt to be neglected until the hull of the vessel is in a very bad condition. In order to expedite the work and enable it to be done without docking the vessel, an inventor, Gustav Julius Kindermann of Wayville, South Australia, has designed a brush driven by electric motors which may be lowered over the side of the boat and operated under water. There is a motor at each end of the brush, and they are encased in water-tight casings. The casings are provided with spring pressed buffers to keep the brush at a fixed distance from the ship while it is being hauled around under the hull. The brush is dragged under the hull by means of chains attached to the casings. The chains pass down opposite sides of the vessel and are connected to winches on the deck; or if preferred, the device may be operated from floats on each side of the vessel. The brush may be fitted either with wire bristles for scouring purposes, or with a cutting attachment for use when the marine growth is particularly hard.

### The Largest Single Leaf Bascule Bridge in the World

THE bridge recently completed for the B. and O. Railroad across the Calumet River at South Chicago, is the largest single leaf bascule bridge in the world. The total length of span is 235 feet, the weight of the steel work is 1,300 tons and the counter-weight 2,000 tons. This whole mass is moved in the remarkably short space of 1 1/4 minutes, control being effected from the operator's cabin in precisely the same way as a street car is handled and with no more trouble. The bridge was built in the open position, that is, the leaf was vertical, and traffic was maintained on the old structure while the new was in process of construction. After the entire structure had been completed in this position, it was lowered in place and was then found to be less than 3/4 inch out of alignment. The bridge is of the heel trunnion type. In this type, the leaf and the counter-weight are separately mounted and are connected by a link forming part of a parallel link mechanism, the resultant action of the parts being that the center of gravity of the entire structure, that is the leaf and counter-weight, moves neither vertically nor horizontally. Therefore, the only effort required to operate the structure is that necessary to overcome friction and wind resistance. Furthermore, the reactions on the piers are vertical and constant throughout the entire operation of the bridge, and the size of the piers is much smaller than has heretofore been possible in bascule construction. While the bridge is normally operated by electricity, a gasoline engine drive is provided for emergency operation.

### The Origin of the American Indians

D<sup>R.</sup> A. HIRDLICKA, of the United States National Museum, has recently made an extensive visit to southeastern Siberia and northern Mongolia, for the express purpose of seeking possible remains of the race that peopled America, i. e., the ancestors of the American Indians. He investigated both the contents of ancient burial mounds and the Asiatic tribes of the present day, and in both cases found much more evidence than he expected. He concludes that there exist to-day over large parts of eastern Siberia, and in Mongolia, Tibet, and other regions in that part of the world, numerous remains, which now form constituent parts of more modern tribes or nations, of a more ancient population, perhaps related in origin to the latest paleolithic Europeans, which was physically identical with and in all probability gave rise to the American Indians. He reports a vast and rich field for anthropological and archaeological research in eastern Asia.

## Inventions New and Interesting

Simple Patent Law ; Patent Office News ; Notes on Trademarks

### A Lock on the Gasoline Feed

THERE is so great a prevalence of automobile thievery in this country, especially in and around the larger cities, and so much irritation and annoyance incidental to the theft of a car, that any device effective against this evil and sufficiently convenient of operation to insure its regular use should be welcomed by automobile owners.

A device is now being placed on the market which prevents thievery by placing a lock on the gasoline feed. It consists of a Yale pin tumbler cylinder lock located within a very substantial spherical brass casting, a shaft extending downward from this ball head, protected by telescoped guard tubes of steel and geared to the lock cylinder within the ball head, and a one-way valve located at the lower end of the shaft. Means are provided for securely and neatly bolting the ball head to the dash, and the construction is such as to make it practically impossible to detach the device from the dash when locked.

The valve is installed in the gasoline feed pipe by means of a double compression joint on each side of the valve. A thumb button is located on the face of the ball head, and it requires merely a quarter turn of this button to close and lock the valve. The key, therefore, is not needed for this operation, and consequently it requires only one second of time to lock the device. The insertion of the key and a quarter turn of the thumb button back to its original position unlocks and opens the device. Yale locks are used, and, of course, no two keys are alike.

The guard tubes and shaft are of adjustable design and are supplied in four different lengths, so that the device may be installed on any make of automobile. The benefits claimed for this device are that it absolutely precludes a leaky carburetor, it materially lessens the chances and dangers of back firing, and it prevents theft of the machine.

### The James Internal Combustion Engine

THE main objection to the ordinary internal combustion engine in use on automobiles is the noise caused by the operation of the well-known puppet or mushroom valves. Except for this objection, these valves serve their purpose admirably, but the gear for operating them, with its cams, tappet rods and springs, is objectionable on account of the ease with which the various parts get out of order and are broken.

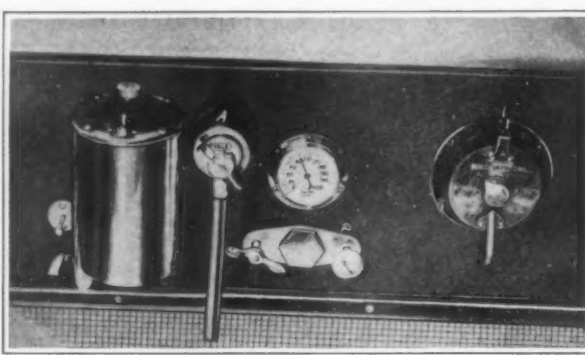
An interesting engine, recently invented by T. S. James of Chiswick, London, England, does away with the usual puppet valve and its accompanying gear and uses instead a single rotary sleeve valve actuated from the crank-shaft by a mutilated gear placed upon the periphery of two flywheels. This engine, on account of its simplicity, the fewness of its parts and the cheapness of its manufacture, it is claimed, will revolutionize all gas engine construction.

The James engine, as seen in the figures, is a four-cycle gas engine in which a single rotary sleeve valve performs the functions of the usual inlet and exhaust valves. This valve is fitted over the reciprocating piston and is operated by two mutilated worm gears mounted on the periphery of a pair of flywheels inside the crank casing, the valve being provided with teeth on its lower part which mesh with the worm gearing on the flywheels.

The cylinder head contains two ports, one for the inlet and one for the exhaust, between which is placed the usual spark plug. The upper end of the valve has four ports which successively register with the inlet port, spark plug and exhaust port in the cylinder head to produce the suction, compression and exhaust strokes of the engine. It will thus be seen that these ports are automatically cleansed every few revolutions. The valve is also provided centrally with a stem over which the cylinder head is fitted. A set of nuts on this stem provides for the adjustment of the valve in relation to the cylinder head, the last being secured to



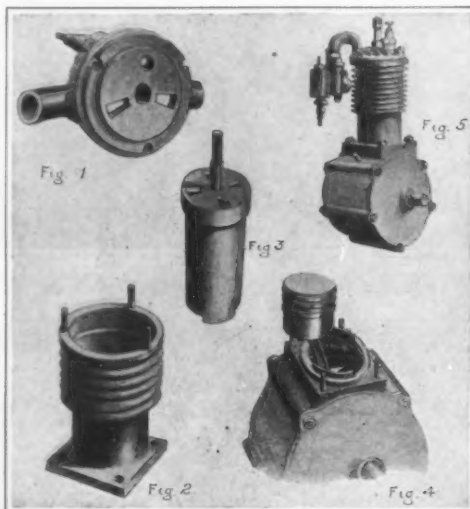
The gasoline lock.



Dashboard of a car showing the location of the lock. Thus the theft of a car is prevented.

the casing by the usual bolts. The teeth on the valve and worm gears are so related as to provide for proper timing for the various strokes of the engine.

By this construction the valve is moved only when under atmospheric pressure, no movement taking place during the compression or during the expansion strokes, and, since the two surfaces between the cylinder head



A new four-cycle gas engine.

Fig. 1.—Detachable combustion head showing slots and sparking plug. Fig. 2.—Open-ended cylinder, inside which the sleeve works. Fig. 3.—Internal rotating sleeve, showing parts which register with slots in cylinder head. Fig. 4.—Worm on the rim of flywheel and driving ring which it operates. Fig. 5.—Complete air-cooled engine, showing simple appearance.

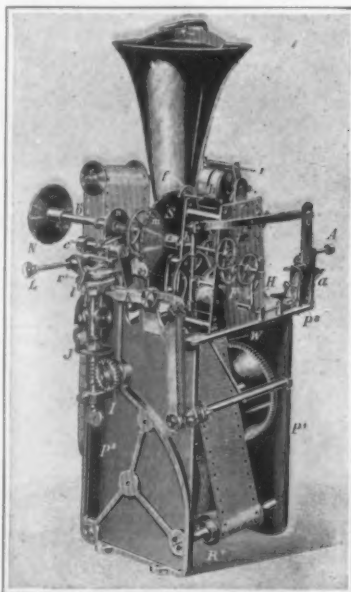


Fig. 1.—Front view of mechanism of phonographic alarm clock.

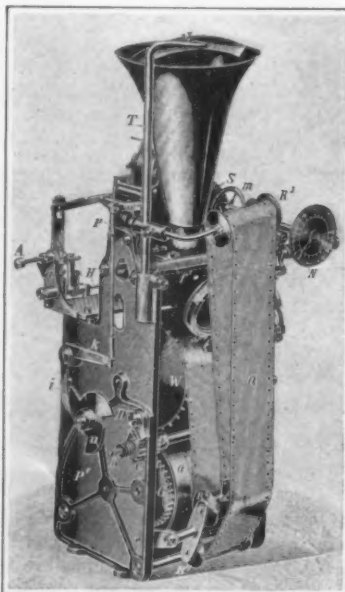


Fig. 2.—Rear view of mechanism of phonographic alarm clock.

and the valve are ground flat, it is said no leakage can occur. It is also claimed that there is no difficulty in the lubrication and no danger of overheating.

### A Phonographic Alarm Clock

By Walter Isendahl

IT is now possible to purchase an alarm clock which calls the hour in a clear human voice, instead of announcing it by the ringing of a bell. The phonographic alarm clock is not a new invention. A clock of this sort was shown at the Paris exposition in 1900, but it was very different from the new clock described below. The Paris clock was a huge construction, which resembled a clothes-press. It stood six feet high, weighed a hundred pounds and cost about \$2,500, while the

new clock is only 16 inches high and costs only \$25. It can be adjusted to call out each quarter of every hour, and the call can be repeated by pressing a button. When it is used as an alarm clock, the alarm pointer is set at the desired hour—say, seven o'clock. Promptly at the stroke of seven the clock begins to call: "Seven o'clock! Seven o'clock! Seven o'clock!" and continues calling until the alarm is turned off or until 15 minutes have elapsed, when the call is changed to "Seven fifteen! Seven fifteen!" and so on.

At any time during the night a touch on a button evokes the proper call for the current quarter-hour. Calls in thirty-five languages are provided, and the change from one language to another is easily effected.

The mechanism of the speaking clock is simple in principle. The phonograph record is made on an endless band about 2 inches wide and 40 inches long which is carried by a number of cylinders. The 48 calls which are required in order to announce each quarter-hour of the twelve hours, are recorded in 48 parallel grooves, each of which occupies the whole length of the band. The reproducing needle has a sapphire point, and the record band is made of very hard material. When the band is injured by use or accident a new one can be substituted without difficulty.

The needle is kept accurately in the proper groove by a spring device, similar to that employed in computing machines, which is so contrived that the clock can be set by turning the hands either forward or backward, without waiting to allow the intervening quarter-hours to be called. In the operation of setting the clock, the needle moves across the band without touching it, and when the clock is started, the needle falls accurately into the groove corresponding to the changed time. If, however, the hands should be moved while a call was being uttered, the needle would be dragged across the grooves and the record would be injured. The sound is intensified by a small horn, which is inclosed in the clock case.

The accompanying illustrations show the external appearance and the interior mechanism of the clock. The talking mechanism is in the lower part, between the vertical plates  $P_1$ ,  $P_2$  (Fig. 1) and beneath the horizontal plate  $P_3$ , which supports the clock train and alarm mechanism. The clock work has an anchor escapement, protected by a cap  $h$ . The regulator can be adjusted from the outside by means of a slit in the dial. By moving the lever  $f$  a piece of clock spring can be inserted through a slit into the cap  $h$ , in order to stop the balance wheel transportation, or to start the wheel if it should fail to start spontaneously.  $H$  is the alarm lever, actuated by the spring  $F$ . The alarm can be stopped by pressing the button  $A$ , which protrudes from the case.

The driving spring of the phonograph is contained in the barrel  $O$  (Fig. 2), and the winding post, pinion and wheel are indicated respectively by  $B$ ,  $E$  and  $G$ . The last wheel of the phonograph train  $I$  (Fig. 1) engages with the endless screw of the regulator  $J$ . The lever  $K$  (Fig. 1), connected with the time clock, keeps the phonograph regulator and train motionless until the proper moment, when the lever falls and releases the phonograph mechanism. The second band is then drawn along by the traction cylinder  $W$ .

which bears pins that engage in holes in the band. The movement is rapid, as the band moves through its entire length of 40 inches for each call.

The manner in which the long band is stowed and kept taut in the small case is shown in the illustrations. From the cylinder  $R^1$  (at the bottom of Fig. 2) the band passes under the works to the front, and around the cylinder  $R_4$  (Fig. 1), whence it ascends, passes over the traction cylinder  $W$  and around the small cylinders  $R_2$  and  $R_3$  (Fig. 2) to  $R_1$ , the arbitrary starting point.

A very ingenious mechanism is employed to bring the reproducing needle accurately to the record groove corresponding to the time. The arbor  $b$  (Fig. 1), connected with the time clock, makes one revolution in 12 hours and carries a large ratchet wheel  $S$ , having 48 teeth, upon which rests a lever connected with the reproducing membrane  $M$  (Fig. 2). This lever is pressed against the wheel  $S$  by the train of levers  $p, k, i$ , operated by the triple cam  $u$ , which is mounted on an arbor of the phonograph train. This arbor turns in the cam with a degree of friction which does not impede the movement of the phonograph train when the cam is motionless, during the utterance of a call.

The mechanism for suppressing the calls during the night is illustrated in Fig. 1. Behind the wheel  $S$  is a small wheel, which engages with a wheel  $m$  of twice its own diameter, which consequently makes one revolution in 24 hours. The hollow shaft of the wheel  $m$  turns with friction on the long shaft  $b^1$ , which carries at its inner end an eccentric  $n$  and at its outer end a pointer that can be turned to any desired mark on the alarm dial  $N$ , which is divided into 24-hour spaces. The clock remains silent for 12 hours from the time to which the pointer is set.

The clock can also be silenced completely or partially by turning the knob  $L$  attached to the lever  $l$  (Fig. 1). In the position shown in Fig. 1 this lever suppresses the calls entirely by pressing against a pin  $r^1$  of the phonograph regulator  $J$ . When the knob  $L$  is turned 90 degrees to the left the calls are made only during the 12 hours in which they are not suppressed by the setting of the pointer of the alarm dial  $N$ , as described above. By giving the knob  $L$  another quarter turn to the left the lever  $l$  strikes the pin  $c$  and thereby eliminates the action of the pointer, so that the quarter-hours are called throughout the day and night.

The horn is suspended by its rim from the support  $T$  (Fig. 2), and swings freely, so that it can follow the motion of the reproducing membrane.

### Some Expired Patents

**A**MONG the important patents granted in 1896 and expiring in the present year 1913 are the following: The reciprocating cotton chopper of Summers, 573,369, of December 15th, 1896; the check rowing, drilling and planting machine of Kaylor, 555,319, February 25th, 1896; the force feed seeding machine of Ham, 564,424, July 21st, 1896; the seeding machine of Morse, 557,010, March 24th, 1896; the Outram patent, 569,298, of October 13th, 1896, which provided for separating the thrashed grain from the straw and disposing of the straw by pneumatic means; No. 574,121 of December 29th, 1896, and 557,089 of March 24th, 1896, to Swenson, and 558,171 of April 14th, 1896, to Griffin embodying the volute type of cotton press; the Baron cigarette machine patent, No. 555,417; the patent 566,058 to Bunn for cigar rolling machine; the Wilson patent, 567,210, for removing liquid elements from garbage and the like; the Sternberg patent of March 31st, 1896, for obtaining ammonia from waste lyes from beet root molasses by subjecting said lyes to incandescence in presence of a contact body; the patent to Gallet, 563,600, relating to the chemical purification of water; the Button canal lock patent, 557,564; patent

564,205 to Liebau for partition for use in buildings; the Greenshield patent, 567,232, for traveling machine for setting railway tie plates; the mechanical furnace stoker of Dodge, 565,334; the coal or ore loading patent, 558,200, to McMyler; the Long patent, 560,727, for a coal tippie; the straw stacker patent, 569,504, to Landis; the Philips and Hunt patent, 570,880, for distribution of grain in a car; the truck ladder patent, 568,990, to Young; the Kapp patent, 570,590, for preventing the electrolysis of water in gas pipes by currents from power circuits; the Tillman patent, 573,496, for safety system for electric railways; the tank flushing patents, 566,770 and 566,771, to Kenney; the hydraulic press of Graves, 565,111; 560,993, to Heston for valve for water distribution; the Richards patents, 560,647, 562,662, 568,581, for pedaling features of bicycles; the Sperry patents, 571,409 and 574,120, for electric railway brakes; the interlocking of motor reversing and brake controlling switch patent, 560,751, to Potter; the Applegate patent, 568,226, for metal insert cast in face of brake shoe; the Nobel patent, 563,609, for ring sabots for projectiles to prevent hot gas from injuring the gun.

The naval gun mount patent of Dashiell, No. 573,210; the disappearing gun patent, No. 555,426, of Buffington and Crozier, and 556,926 of Dawson; the Ehbets patent, No. 570,388, for magazine gun; the Bakewell patent, 572,401, in which it is attempted to render dynamite non-sensitive to the shock of a gun discharge by freezing it to make it suitable for a bursting charge for shells; the Curtis steam turbine patent, No. 566,969; the Caum patent, 564,969, for lubricator in which air pressure is utilized to force the oil to the point of use; the lubricator patent, 556,074, to Tippet, in which the oil is displaced by condensation of steam; the Butler lubricator patent, 564,503; the Hall and Espey fire lighter for fire engines, in which a vial of sulphuric acid is broken into a box containing a mixture of potassium chlorate, sulphur, and sugar or the like; acetylene gas generator patents, including Dickerson 533,781, Clark 556,736, Porter 562,911, and Bucher 569,273; the automatic glass bottle machine patent of Blue, 567,071; the Mather patent, 555,650, for the manufacture of inlaid linoleum or floor cloth; patent to Laster, 552,913, for repairing defective worn asphalt pavements; the Wetherill patent, 555,792, for the separation of metals of finely differing magnetic susceptibilities; the Preston patent, 555,882, for the field ration mess kit used by the United States troops in the war with Spain; the bottle labeling machine of Kohl, 573,667; the can labeling machine patent of Petree, No. 560,324; the box machine patents, 556,996, 556,997, and 557,516 to Loyens and Paulson; the match-box shuck-making machine patent, 554,987, to Corkhill, Jr.; the interlocking cell case patent, 573,947, to Williams; the Bonsack cigarette machine patent, 565,853; the Groube patent, 566,075, for fixing wires or threads in envelopes to assist in opening the same; the Scott patent, 558,424, for associating folding and delivering printed matter from a rotary press; the bed and cylinder printing press of Miehe, 574,207; the typewriting machine patents to Daugherty, 553,153, and Wagner, 559,345; the book typewriter patents to Fisher, 569,625 and 569,627, and to Elliott, 573,081; the power typewriter patent to Selden, 557,239; the electrical typewriter patents to Davis, 560,572 and 560,573, and Cahill, 566,442; the Timewell patent, 562,438, for machine for sewing the mouth of a filled bag; the Gammon patent, 555,479, for machine for sewing sweat band into a hat body; the Dees patent, 555,037, for log sawing machine; the Davidson patent, 561,569, for sawing machine; the wood turning lathe patents to Topping, 572,726, and Elder and Kelly, 569,488; the calculator machine patent to Felt, 568,021; patent 567,315 to Honis for fare register; the weighing machine patent, 570,303, to Richards; the Oliveri clarinet patent, 570,647; the Cowles patent, 564,474, for closing the doors of ships from

bridge or pilot house; the Gordon life-saving patent, 572,100; the screw propeller patents of Bray, 554,331, and Hubbard, 573,977; the Obry patent, 562,235, for automatic steering device embodying gyroscopic mechanism; the Wernicke & Burr sectional or knock-down book-case patent, 557,736; the all glass show-case patent, 561,339, of Pollard, and the Hurlbut patent, 563,664, for sanitary flushing pipe spilttoon.

### Legal Notes

**Article on Process Patent Rejected.**—The Court of Appeals of the District of Columbia in the case of *ex parte Griffith* has held that claims for a composite metal article are unpatentable in view of applicant's process patent issued twelve years prior to the filing of the application for the article and in which prior patent is disclosed "the very process by which the product covered by these claims is initially produced."

**Eagle Pencil Company Trade-mark Case.**—In affirming the decision of the Commissioner of Patents in *re Eagle Pencil Company*, the Court of Appeals of the District of Columbia holds that a trademark for pen and pencil holders consisting of a circumferential band of red color contrasting with a yellow or gilt color was properly refused registration in view of the prior registration of marks consisting of circumferential bands of different colors applied to goods of the same descriptive properties.

**Some New Court of Appeals Rules.**—The Court of Appeals of the District of Columbia has promulgated under date of February 4th, 1913, some rules looking toward reducing the expenses of appeals by a restriction of the printed records. The rules also provide that it shall be permissible for counsel for the respective parties subject to the approval of the Commissioner of Patents to agree upon a statement of the case setting forth the questions raised by appeal and so much only of the evidence as may be necessary to a decision of such questions. The new rules are important to inventors since they will result in a material saving of expense in appealing from the Commissioner of Patents to the Court.

**An Appeal from the Philippine Supreme Court.**—The Supreme Court of the United States in the appeal from the Supreme Court of the Philippine Islands in *Ubeda v. Zialetta* has held that one whose registered trade-mark is manifestly an imitation of an earlier but unregistered trade-mark cannot restrain a third party from using it and that imposition on the public is not a good ground on which the plaintiff can come into court, but it is a very good ground for keeping him out. In the course of the decision, Mr. Justice Holmes, who delivered the opinion of the Court, said: "With or without right, the earlier trademark was in widespread use and well known, and the obvious intent and necessary effect of imitating it was to steal some of the good-will attaching to it and to defraud the public."

**Design Patent Sustained.**—In the case of *Theodore W. Foster & Bro. Co. v. Tilden-Thurber Company*, the Circuit Court of Appeals, First Circuit, Circuit Judges Colt, Putnam and Dodge, decision by Justice Dodge, has affirmed the decree of the District Court and held that the clothes brush patented July 26th, 1910, No. 40,789, is a proper subject for a design patent, also that a patent may be granted for a design although its ornamental character consists merely in a new and original shape given to an article of manufacture. In the District Court the patent was held valid and infringed. The decision of the Circuit Court goes on to say that the record contains evidence tending to show that clothes brushes of the patented design have been found acceptable in a trade where attractiveness of appearance is a matter of importance. The District Court thought this evidence sufficient for the conclusion that the design shows a patentable degree of artistic invention "and we are of the same opinion."

### Notes for Inventors

**A Curbstone Footlight.**—A street-lighting device, patented by Thomas S. Brown of Hemet, Cal., No. 1,045,253, includes in combination with a street curb, a hood somewhat similar to a footlight hood together with means for securing the hood in place upon the curb and an electric light mounted in the hood.

**A Combined Bed, Chair and Table in One.**—By an ingenious arrangement of lazy tongs, and links of various lengths in connection with platform sections, Theodor Engstrand of Dansville, N. Y., in patent No. 1,046,163 provides a single article of furniture which can be adjusted to serve as either a table, a chair or a bed.

**A Megaphone Ear Drum.**—In patent No. 1,045,812 John B. Campbell of New York city presents an artificial ear drum having a megaphone arranged within it and adapted to concentrate sound waves passing into the drum. The smaller end of the megaphone is connected with the inner end or apex of the drum.

**A New Arc-lamp Globe.**—The General Electric Company, as assignee of John T. H. Dempster of Schenectady, in patent No. 1,046,152 describes an arc-lamp globe of siliceous material on whose inner surface is applied a solidified layer of light-transmitting resinous varnish which protects the globe from direct contact with particles which have chemical affinity with it.

**The Bitter Bitten.**—For preventing dogs from worrying sheep, William Graham of Cookshire, Quebec, Can., in a patent, No. 1,046,177, describes a device which has a ring member secured in practice to the nose of the dog and a hook is rigidly secured to the ring so that it will become entangled in the wool of the sheep that the dog may try to worry so that when the sheep starts to run he will pull upon the ring to pull the dog's nose.

**A Gasoline Engine Starter.**—Webb Jay, of Chicago, Ill., in a patent, No. 1,052,826, shows a gasoline engine which is provided with a by-pass conduit around the usual carburetor through which by-pass explosive fluid additional to that supplied through the carburetor may be supplied to the cylinder or cylinders by the suction created in the cylinder in starting the engine. The by-pass conduit is provided with a valve which can be opened at will by the operator.

**A Novel Union Suit.**—In patent No. 1,057,602, Kirk H. White of Oswego, N. Y., assignor of one half to Marshall S. Ely, of New York city, is presented a union suit which has about its middle portion a two-part elastic band which extends around the garment with the part of the band at the front of the garment elastic in a horizontal direction and that part across the back of the garment elastic vertically, so that the elasticity at the waist line is secured at the front of the garment and up and down at the back of the garment, as desired.

**Indicates Proximity of Icebergs at Sea.**—In a patent, No. 1,057,807, to Willard G. Day of Baltimore, Md., is disclosed an apparatus for indicating the proximity of icebergs, in which there is a flexible strip having an exposed side and a protected side together with means to direct the air to the exposed side of the strip and devices are provided by which the deflection of the strip by certain variations in temperature will operate to produce an alarm and thus indicate the presence of an iceberg in the vicinity.

**A Self-returning Stylus Groove for Gramophone Records.**—A novel form of gramophone record is shown in patent No. 1,046,650 to Cornelius Leonard Roth-eudt of Walheim, near Ascheln, Germany, in which the disk has a return groove carried across the turns of the record groove and connecting the ends of the record groove so that when the stylus reaches the inner end of the record groove it will be automatically returned to its starting point. The return groove is carried in a parabolic curve across the turns of the record groove and in operation so long as the motor continues to work the record will be repeated over and over.

## RECENTLY PATENTED INVENTIONS

These columns are open to all patentees. The notices are inserted by special arrangement with the inventors. Terms on application to the Advertising Department of the SCIENTIFIC AMERICAN.

## Pertaining to Apparel.

**SWIMMING SUIT.**—S. ROTH, 162 E. 103rd St., New York, N. Y. This invention comprises certain improvements especially designed to be used in connection with submarines for the purpose of enabling the members of the crew of the submarine vessel to escape therefrom in case of accident and make their way safely to the surface of the water.

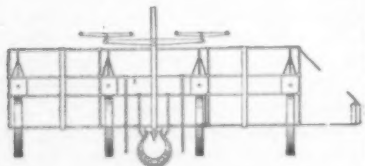
## Electrical Devices.

**ELECTRIC INDICATOR.**—F. J. BURNS and W. L. ANDRE, address the latter care of Mass. Bonding and Ins. Co., Old Nat'l Bank Bldg., Spokane, Wash. The purpose here is to produce an indicator more particularly for indicating the designations of streets and the like, which is operated automatically by movements of a car or other piece of rolling stock and provided with means for indicating the streets in reverse order in case the car or other piece of rolling stock happens to run backward during a trip.

## Of Interest to Farmers.

**MOTOR DISK PLOW.**—J. M. HENTON, Edgemont, S. D. The invention provides means for rotating the disk independently of the progression of the plow; provides means for rotating plowing disks at a variable speed greater than the travel of the plow; provides means on the disks for cross-cutting or grooving the bottom of furrows made by the disks; and provides a simplified transmission mechanism whereby power is transmitted from an engine to the plowing disks.

**CORN PLANTER.**—A. F. STARR, 177 W. 37th St., Los Angeles, Cal. The purpose of this invention is to provide a new and improved corn planter, arranged to plant or drill a plurality of rows at one time, to properly prepare the ground for the reception of the seeds,



CORN PLANTER.

and to subsequently cover the seed to insure ready germination thereof. Four rows can be planted at once and the seed-containing vessels can be readily removed and refilled when necessary.

## Of General Interest.

**PACK HITCH.**—A. B. WALKER, Republic, Wash. The object in this case is to provide an inexpensive device for use in permitting a pack to be quickly loaded and secured in place without the use of ropes or the like, which are liable to slip and to loosen the load.

**DIAL MOUNTING.**—B. PETERSEN, Ortonville, Minn. The invention provides a mounting for securing the watch dial in position with respect to the watch frame, and other like purposes by means of which the dial can be securely held in position, notwithstanding that it can be readily released and removed when desired, which adds little to the weight and size of the structure with which it is employed and which can be manipulated with ease and rapidity.

**LOOSE LEAF BINDER.**—W. A. OVERBECK, 310 So. 3rd St., East, Salt Lake City, Utah. The principal purpose of the invention is to provide a loose leaf binder which will open in a flat condition, the means for holding the leaves within the binder being improved in that such means is flexible, the construction and arrangement being such that the outfit will permit rough usage without being injured.

**CASE FOR HYPODERMIC SYRINGES.**—F. S. DICKINSON, care of Berton & Dickinson, E. Rutherford, N. J. The case holds a hypodermic syringe, a plurality of needles and a number of vials adapted to contain medicinal liquid preparations for charging the syringe prior to making a desired injection, the arrangement being such that the syringe, needles and vials are securely held in place to prevent rattling, and can be readily removed for use without danger of breaking the vials, or marring the labels.

**WINDOW PLATFORM.**—J. DYBECK, L. B. 483 Sault Ste. Marie, Mich. This invention relates to temporary scaffold or the like, and has particular reference to means to permit access to the outside of a window for any purpose such as cleaning, glazing, painting, etc. It may be manipulated by one person from the inside, and is adapted to various widths of windows or to walls of different thicknesses and forms.

**FLUSHING APPARATUS.**—N. J. GONDOLÉ, 703 State St., New Orleans, La. The siphon

is started by a jet of water supplied directly by the water supply pipe, and a valve controls both the water inlet pipe and the jet pipe for starting the siphon. The valve is so arranged as to close the branch leading to the siphon and the inlet pipe in succession, so that the branch pipe is first closed and then the inlet pipe.

**SOAP DISPENSING RECEPTACLE.**—S. F. KOHN, 190 Brown Place, corner 136th St., New York, N. Y. In the present patent the principal object which the invention has in view is the provision of a receptacle adapted for employment to hold soap or similar material in cake or bar form, and to hold and to dispense saponaceous powder.

**APPARATUS FOR THE MANUFACTURE OF METALLIC ZINC.**—R. D. LANCE, 6 bis Rue de Sartoris, La Garenne-Colombes, Seine, France. The invention refers to devices for manufacturing metallic zinc and zinc white. It provides for reducing zinc oxide which will accomplish the reduction at comparatively low cost. The retorts are located in chambers, whose temperature may be readily controlled so as to obtain the most suitable temperature for carrying out portions of the process.

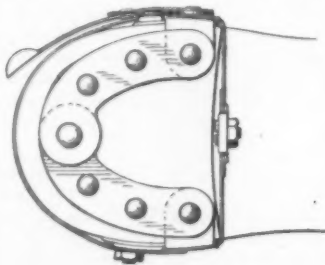
## Hardware and Tools.

**MAGAZINE TACK HAMMER.**—T. MCKEAN, 59 Yale Ave., Jamaica, N. Y. An object here is to provide a hammer having means for successively feeding the tacks adjacent the head of the hammer. Further, to provide means for holding a tack exposed and in position for being initially driven into a body, the driving to be later finished by a blow of the hammer head itself.

**ROOF SQUARE.**—P. N. BERGGREN, 228 Pomona Ave., San Jose, Cal. This square is especially fitted for roof work, but equally adapted for any work wherein an ordinary or bevel square may be used, which will be easily manipulated to indicate the correct angle, and locked in the required position, and which when not in use may be folded into small compass.

**PIPE WRENCH.**—D. S. SEBASTIAN, Wallace, Idaho. This wrench is particularly of that type used by plumbers or others for handling pipes or rods. The inventor's primary object is to improve this type of wrenches with respect to quickness of adjustment, reliability of securing such adjustment, and the increase of the gripping effect of the jaws.

**ICE CREEPER.**—C. FEISTER, Ardsley, N. Y. This article is more especially designed for use by pedestrians to prevent the same from



ICE CREEPER.

falling on slippery surfaces and the invention permits of securely fastening the creeper to the heel of a shoe or boot or removing it therefrom before entering a building, and allows adjustment of the parts for different sized heels.

## Heating and Lighting.

**HEATING APPARATUS.**—A. E. BAUM and A. SCHOEL, 42 Lafayette St., Waterloo, Iowa. This improvement provides a heater adapted for installation in the usual fire opening of a chimney-breast, employing water as a storage medium; and provides a boiler for the heater simple and economical and adapted to provide free and easy circulation of heated air.

## Household Utilities.

**WINDOW CURTAIN OPERATING MECHANISM.**—F. W. ADLER, New Baden, Tex. The invention provides means for operating a curtain which is positive and independent of springs or other devices subject to disorganization; and provides a mechanism adapted for operation to lift the curtain from the sill of the window upward.

**WEATHER STRIP OR SEAL FOR SLIDING WINDOW SASHES.**—R. W. CROSS, 715 Masten St., Dallas, Tex. This inventor provides a strip which will effectually and automatically seal the meeting edges of the upper and lower sashes of windows wherein the sashes have a sliding movement with relation to each other in the frame, for the purpose of opening and closing the window.

## Machines and Mechanical Devices.

**MOVING PICTURE SCREEN.**—P. E. THOMASON, care of N. A. Cocke, Trust Bldg., Charlotte, N. C. The object here is to provide a screen which may be operated to present a plain white surface for receiving the display of the pictures, or which may be operated to present a display of advertisements or the like when the pictures are not being displayed.

**CLOTH ORNAMENTING MACHINE.**—G.

W. PARKINSON and R. S. TOMPKINS, care of Louis W. Statesbury, 55 Liberty St., Fishkill-on-the-Hudson, N. Y. This invention relates to hat-making machinery, and provides a machine more especially designed for ornamenting into the surface of felt, wool, fur or other material used in making hats or caps, so that the said material presents a surface in close imitation of corduroy, stitching or the like.

**WEIGHING MACHINE.**—A. SMITH and C. SOUTHALL, engineers, Villa Street Works, Birmingham, England. The invention relates to machines for weighing tea, coffee, flour, cocoa, wheat, maize, seeds and other granular, pulverulent, powdered and like materials, the object being to provide mechanical means for controlling the operations of the sluices, valves, cut-offs or the like.

**LOOM SHUTTLE.**—W. H. WILSON, 7 Bedford St., New Bedford, Mass. This invention relates to self-threading shuttles such as shown and described in Patent No. 987,524 granted to Mr. Wilson. The present invention provides a shuttle arranged to permit of securely fastening the thread-retaining device in place in the shuttle body and to prevent the thread from catching or ballooning.

**FOOT-POWER MOTOR.**—W. E. WERD and F. STEVENS, Roundup, Mont. The more particular purpose of this invention is to provide a type of continuous drive motor operated by the feet somewhat after the manner of pedaling a bicycle, and adapted to drive various kinds of light mechanisms, such as churns, ice cream freezers, washing machines, drills, pumps, punches, and the like.

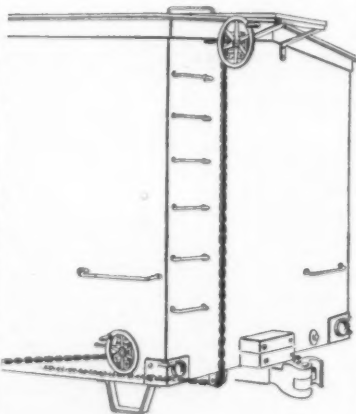
**INTERMITTENT MOTION FOR MOVING PICTURE MACHINES.**—J. C. COLLINS, 2305 Second Ave., Manhattan, N. Y., N. Y. This invention has reference to improvements in moving picture machines, and particularly to an intermittent motion mechanism therefor, and has for an object to provide an improved structure for operating the intermittent sprocket wheel.

**PILE FABRIC LOOM.**—J. HAGGERTY, 78 Barron St., New York, N. Y. The purpose here is to provide a loom arranged to insure the proper formation of a continuous pile warp thread into knots, to draw the knots tight with a view to form a high grade rug in which the piles are not liable to become loose and be drawn out when sweeping or cleaning the rug.

## Railways and Their Accessories.

**AUTOMATIC BRAKE VALVE MECHANISM FOR CARS.**—J. JUDGE, 166 William St., Pittston, Pa. This invention provides a means for automatically opening a valve in the train pipe of a car when a truck on the car is damaged. When the axle is broken, when the wheel is broken or jumps the track, or when the track spreads or the rail is broken permitting the car wheel to fall to the ties, the axle will bear down on the member which will operate the valve through the levers and the rod to open the train pipe, thereby applying the brakes.

**CAR BRAKE.**—C. E. ROCHAMBEAU, 2613 So. 18th St., St. Joseph, Mo. This invention relates to railway rolling stock and has particular reference to a form of hand operated brake



CAR BRAKE.

for freight cars or the like, whereby the trainman or brakeman will have better control of a car, especially in a switch yard where the cars are being handled in detached relation to the engine than has hitherto been possible with the ordinary forms of brakes.

**RAIL JOINT.**—H. SOUDEN and W. S. LEAHY, Lebanon, Pa. In this case the invention relates to rail joints of the class in which the securing bolts are each locked in place by a single wedge plate, and the object is to provide a construction which is such as to prevent lateral movement and binding of the bolts in operating the plate to lock the bolts, and to provide means for moving and locking the plate.

## Pertaining to Vehicles.

**AUTOMOBILE BODY.**—F. SAXON, Worthington, Minn. In general appearance the body exterior is not changed by the invention from standard designs of regular touring cars, but

provision is made for converting the seats into a couch or bed by providing an arrangement of a lazy-back to a forward seat, to adapt it to assume a horizontal position between a forward and rear seat cushion to form a couch.

**AIR PUMP.**—C. M. SCOTT, 212 W. 6th St., San Angelo, Tex. The aim of this invention is attained by positioning an air pump upon a wheel with a fluid connection between the pump and the tire, the pump being actuated at will by gearing the pump piston actuating means with a stationary element on the vehicle, so that the revolving of the wheel itself will actuate the pump.

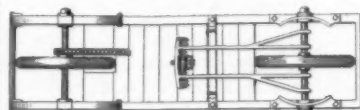
**TRACTION WHEEL AND MEANS FOR DRIVING SAME.**—M. A. GRALEY, 1221 Wood St., Texarkana, Tex. The object here is to construct and mount wheels on hollow axles so that they may be driven by a shaft disposed in the hollow axles, the gearing by which the vehicle wheels are driven being disposed within the plane of the sides of the tires, plates being secured to the tires to inclose the gearing.

**WAGON ATTACHMENT.**—J. D. HAMMOND, Room 324 Security Bldg., Galveston, Tex. The inventor provides a child's wagon with a device having a foot rest on which one foot of the operator may rest while the operator pushes it with his other foot, the device being so constructed that it may be moved out of the way to permit of the use of the wagon in the customary manner.

**DRIVING MECHANISM FOR MOTOR VEHICLES.**—J. D. ROWLAND, director of Warne, Wright & Rowland, Limited, 56-59 Watery Lane, Birmingham, England. This invention relates to driving mechanism for, more especially, four-wheel motor road vehicles of the belt or chain driven type, and has for its object to provide means for controlling such mechanism. Mechanism connected with an expansionable pulley is adapted to permit operation of the pulley independently of the rear axle as well as conjointly with the said axle.

**TIRE CHAIN.**—D. J. MARTIN, 29 E. 120th St., New York, N. Y. This invention relates to anti-skid devices adapted to be positioned about the tire of the traction wheel, and particularly relates to means for maintaining the chains in spaced-apart position on the tire. It provides an auxiliary reinforcement for the tread-engaging portion of the tire, to hold the device in position on the wheel even should some of the tread-links of the chain construction break.

**MOTOR VEHICLE.**—C. H. KUYPER, 3646 Zumstelt Ave., Hyde Park, Cincinnati, Ohio. This invention relates to motor vehicles, particularly to vehicles on the order of the two-wheeled vehicle, and has for an object the arrangement of improved means for providing



MOTOR VEHICLE.

the effect of an automobile body at a minimum cost with the use of a minimum number of parts, including the use of only a pair of supporting traction wheels. Means provide for supporting a comparatively large seat, and most of the various operating parts of the vehicle, on the order of an ordinary chassis, but utilizing only a single front and a single rear supporting wheel.

## Designs.

**DESIGN FOR A BATHING CAP.**—J. R. PARKER, care of Parker, Stearns & Co., 300 Sheffield Ave., Brooklyn, N. Y. This ornamental design for a bathing cap shows an article round topped and somewhat high with a fluted band around the bottom, and above this a bow and in front a rosette with a large button in the center.

**NOTE.**—Copies of any of these patents will be furnished by the SCIENTIFIC AMERICAN for ten cents each. Please state the name of the patentee, title of the invention, and date of this paper.

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Inquiry No. 9311. Wanted names and addresses of manufacturers of hatpin heads made of colored glass; also medals of all shapes.

Inquiry No. 9312. Wanted to buy a machine which will pick up a weight the size of a lima bean by vacuum process. Must be able to pick up dust, gravel, etc. Must be operated by electricity and be easily portable.

## The Gasoline and Kerosene Situation

THE invention and perfection of the gasoline motor, and its application to the automobile and power boat, dates back to the high-speed gasoline engine of Gottlieb Daimler, as shown at the historic Mackay-Bennett automobile race from Paris to Bordeaux. Europe gives Daimler full credit for his work by remembering him as the "Father of the Automobile."

The introduction of the Daimler motor opened up an entirely new market for the lighter oils, gasoline and naphtha, which developed within the short period of ten years into larger proportions than the most optimistic oil men ever dreamed of. Under these conditions the inexorable law of supply and demand brought about a price level for the volatile distillates far in excess of former values.

For nearly half a century price advances were extremely moderate, as the fluctuating market quotations of gasoline were ordinarily within narrow limits. An approximate general statement would be that the mean increase in price barring fluctuations was about one mill per annum per gallon—equalling one cent per decade. The total sum of these price increments had brought gasoline from say 5 cents up to 10 cents per gallon in tank car lots at the close of 1911.

But last year an unparalleled increase of 6 cents raised the wholesale price to 16 cents per gallon at the close of the year. In 1912 the wholesale price, therefore, advanced 60 per cent, and the retail price about 75 per cent.

Furthermore, it should be noted that the low cost gasoline of the early days varied in gravity from 70 deg. to 76 deg. Baumé, averaging 72 degrees or 73 degrees, while the gasoline now marketed is about 10 degrees lower. This 62 degrees or 64 degrees product was formerly sold under the trade name of benzine.

United States Government reports show that the advancing price of gasoline is due solely to inelastic laws of supply and demand. No corporation or combination of corporations is responsible for the fact that demand has overtaken production, and that further increases in prices are now impending.

American gasoline and naphtha were formerly obtained solely from high grade paraffine crudes of Pennsylvania and Ohio. These are the most valuable oils in the world, and highest grade Pennsylvania crude now actually brings the same price as refined kerosene in bulk.

But unfortunately Pennsylvania production has fallen from 33,000,000 barrels in 1891 to about 9,000,000 barrels at the present time. However, at present prices even this decreased production represents over \$18,000,000.


Ohio has decreased in production from 24,000,000 barrels in 1896 to less than 9,000,000 barrels during the year last past.

Again, the zenith production of our own State of Indiana was in 1904—over 11,000,000 barrels—but the present yield shows a shrinkage of nearly 90 per cent from maximum.

The United States Geological Survey states that the general decline in production "would doubtless have been much greater but for the effort to apply laws of supply and demand by increases of prices. Prices advanced so greatly during the year as to stimulate drilling, even in the old New York and Pennsylvania pools, and so checked the decline. Formerly this plan has not been so successful. In the mid-continent field also it checked the decline, so that the product will come within 4,000,000 barrels of the maximum output."

Canada, also, has fallen off one third from her highest production of five years ago, and the only new field in sight is Tampico, in Mexico, which has grown from nothing three years ago to 6,000,000 barrels in 1912.

About the only home fields not showing decreased output are in California and Oklahoma. Three fifths of the total yield now comes from these two States. And even the increased output of Oklahoma was insufficient to prevent a continuous



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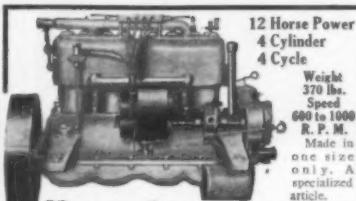
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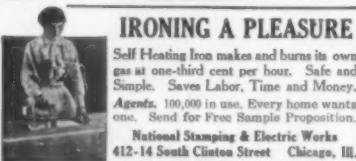
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redemption of stock on hand in 1912. Ninety per cent of the entire output of more than 220,000,000 barrels were crudes which yield a very low percentage of gasoline.

The following market prices of eastern, mid-continent, and western crudes are fairly indicative of their relative gasoline content:

|                        |                 |
|------------------------|-----------------|
| Pennsylvania .....     | \$2.05 per bbl. |
| Indiana .....          | 1.23 per bbl.   |
| Oklahoma and Kansas... | .83 per bbl.    |
| California .....       | .35 per bbl.    |

These prices of crude oil were correct as of January 25th, 1913. Since that time Pennsylvania crude oil advanced 7 cents a barrel on each of three successive days, standing now at \$2.50, and three-dollar oil is freely predicted.

In order to obtain a single gallon of gasoline from refinable California petroleum, it is necessary to produce as by-products nine gallons of kerosene and thirty gallons of residual oils. Notwithstanding the steadily increasing output of western oil the price of gasoline on the coast continues to advance. It is now 30 cents per gallon at retail.

Large shipments of Texas oil formerly came to the Atlantic seaboard in tank steamers, but these shipments have decreased as the Texas oil yield is now less than one third its 1905 output. In view of the Texas shrinkage it is obvious that the opening of the Panama Canal will furnish a large eastern market for California oil, but it is equally obvious that under existing conditions that will not materially affect the gasoline situation.

There are five different methods of increasing the normal visible supply of gasoline.

One is importation. The Standard Oil Company has imported some Russian naphtha, but Russia has no more to spare, as her own oil output is diminishing to such an extent as to increase the price 100 per cent in the last two years, and to warrant the Russian government in the promotion of alcohol production. The Shell Oil Company of England has also shipped some gasoline from Borneo to Canada, but the total quantity available abroad is insufficient for its home demands and America is still exporting gasoline to foreign markets at the rate of fifteen to twenty million gallons per month.

Another and more promising means of obtaining gasoline is by increasing the total yield of American crudes. A yearly production of 300,000,000 barrels in the United States is probably being approached faster than even oil men generally believe. But the largest increase in the production of gasoline in one year has never been more than 5 per cent, while the production of power-driven vehicles will in all probabilities represent an increase this year of around 100 per cent. Furthermore, as already shown, the supply of gasoline-yielding crudes is rapidly decreasing and the increased crude output will consist of Oklahoma and California asphalt oils, having insufficient gasoline for existing requirements.

The third means of supplementing the gasoline supply is the production of gasoline from kerosene. Chemists have known for some time that it was entirely feasible to extract gasoline from the chemically complex kerosene, as well as from coal, coal tar, and even wood. It is simply a question of cost, and of the profitable disposal of resultant by-products. Gasoline is now being made from kerosene, and a further increase in price will stimulate an increased output.

A fourth source of gasoline supply is its manufacture from natural gas by compression, and its subsequent condensation to a liquid form. It is claimed that this process produced 13,000 gallons in 1910, which was increased to 50,000 gallons in 1911 and about twice as much in 1912. Some of the richer gases produce as much as 8 gallons per 1,000 cubic feet, but the average is from 3 to 5½ gallons. By triple and quadruple compression up to pressures as high as 400 pounds, very light liquids up to 85 deg. Baumé are produced, these being slightly more stable

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The fifth and last means of increasing the available gasoline supply is by lowering its Baumé gravity. It is probable that the specific gravity of commercial gasoline will be dropped another notch by next summer. Much of the liquified-gas gasoline is used for blending with heavier distillates, and it naturally requires other than gravity tests to determine the characteristics of such blended gasolines.

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This brief review of market conditions shows that the problem of an adequate supply greatly overshadows the collateral problem of the increasing cost of gasoline.

Fortunately we have two alternative liquid fuels immediately obtainable. Alcohol and kerosene oil offer an ample supply of satisfactory fuel to the power-driven vehicle. We need not discuss alcohol at this time, further than to point out that it is a very good fuel and can be used advantageously if gasoline advances to 20 or 25 cents wholesale. In fact there is no valid reason why alcohol should not be used to-day in cars selling around \$5,000. Of course, special engines with appropriate compression are required, as gasoline engines are not adapted for alcohol.

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[From an address delivered by John A. Secor before the Society of Automobile Engineers (Indiana Section) at the Claypool Hotel, Indianapolis, February 18th, 1913.]

**Determines the Butter Fat in Butter and Dedicates Patent to Public.**—By a method patented by Roscoe H. Shaw of Washington, D. C., No. 1,052,098, it is sought to determine the fat content of butter by placing the butter in a container with hot water, then centrifuging the solution, removing the aqueous solution from the container and adding thereto an equal mixture of sulfuric acid and water, when the contents are again centrifuged and the acid solution is partly drawn off. After this the contents are subjected to a second centrifuging and the container and butter fat are weighed. This patent has been dedicated by the inventor to the public.



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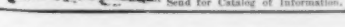
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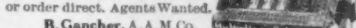
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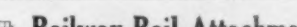
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**HEROES OF SCIENCE.** An Account of the Lives, Sacrifices, Successes, and Failures of Some of the Greatest Scientists in the World's History. By Charles R. Gibson, S.R.S.E. With 19 illustrations. London: Seeley, Service & Co., Ltd., 1913.

Mr. Gibson has written a book in which he reveals to us the romantic and the tragic side of science, an essentially human book, which is frankly intended for popular reading, and which will do much to remove the foolish impression that men of science are bloodless. Among the more conspicuous figures that play a part in this volume are Roger Bacon, Copernicus, Tycho, Kepler, Galileo, Newton, Franklin, Priestley, Cavendish, William and Caroline Herschel, Dalton, Sir Humphry Davy, Darwin, Kelvin, and Maxwell.

**THE INFANCY OF ANIMALS.** By W. P. Pyecraft. Zoological Department of the British Museum. Fellow of the Zoological Society of London, etc. With 64 plates and numerous illustrations in the text. New York: Henry Holt & Co., 1913.

While purely a descriptive work and written entirely along zoological lines, Mr. Pyecraft's volume will be read chiefly by the amateur student of animal life seeking to learn some of the elements of zoology. No attempt is made at a biological interpretation of early animal development nor to fit the facts recorded into current biological theory. For that reason some may be inclined to regard the book as a little old-fashioned. For all that one cannot help feeling that Mr. Pyecraft has given us a very well-written, interesting and instructive book on a phase of animal existence on which very little of a popular character is to be found.

**DIE ELEKTRISCHEN EINRICHTUNGEN DER EISENBAHNEN.** (The Electrical Auxiliary Installations of Railways.) A guide for the self-taught student of the telephone, telegraph and electrical signal installations of railways. By R. Bauer, A. Praseh, and O. Wehr. Third revised edition. Vienna: A. Hartleben, 1913. 432 pp. Price, 6 marks.

The book before us is intended for the use of those who wish to obtain a knowledge of the electrical auxiliary installations employed in railroad service, and who have not a very extensive special training in electricity. But the book really serves more than this purpose, and forms a very useful reference book on a subject on which comprehensive information is not readily obtained in other sources. The book is divided into five sections. The first is introductory, and in 68 pages of text presents the fundamental principles of electricity and magnetism. The second section is devoted to the telegraph, the third to electrical railway signals, the fourth to telephony, and the fifth to the general manipulation of the various forms of apparatus employed and to the discussion of various disorders and breakdowns which are apt to occur.

Both authors and publishers have done their work very excellently in the preparation of this book. Works of this character are somewhat scarce, and for this reason particularly valuable. We would like to see an edition of this book in the English language, so that it might be made accessible to a larger number of our readers.

**THE STOCK EXCHANGE FROM WITHIN.** By W. C. Van Antwerp. Garden City, New York: Doubleday, Page & Co., 1913. 8vo.; 459 pp.; illustrated. Price, \$1.50 net.

The work is an explanation, and to some extent an exoneration, of the Stock Exchange and its methods, by one of its own members. Inasmuch as the author demonstrates the necessity of a stock exchange, familiarizing the reader with all phases of its utility and with the routine of its transactions and its every-day life, the book fills a distinct hiatus in the literature of American business.

**NOTES ON SAMPLING AND TESTING.** The Handbook of the Manchester Chamber of Commerce Testing House and Laboratory. Manchester, England: Marsden & Co., Ltd., 1913. 8vo.; 90 pp.; illustrated.

**CHAMP CLARK.** By W. L. Webb. New York: The Neale Publishing Company, 1912. 8vo.; 256 pp.; illustrated. Price, \$1 net.

**FIRST YEAR ALGEBRA.** By Webster Wells, S.B., and Walter W. Hart, A.B. New York: D. C. Heath & Co., 1912.

**DIRECTORY OF CEMENT, GYPSUM AND LIME MANUFACTURERS.** Seventh edition. Chicago: The Cement Era, 1913. Price, \$1.

**WIRELESS TELEGRAPHY SIMPLY EXPLAINED.** By H. T. Davidge, B.Sc., M.I.E.E. New York: Spon & Chamberlain. Price, 25 cents.

**BUDDHISM.** A Study of the Buddhist Norm. By Mrs. Rhys Davids, M.A. New York: Henry Holt & Co. 16mo.; 255 pp. Price, 50 cents net; by mail, 66 cents.

**BEAUTY OF THE HIGHEST TYPE.** A Scientific and an Artistic Aim for a Nobler Beauty. By Caroline Williams LeFavre. New York: The Health Culture Company, 1912.

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## Notes and Queries

Kindly keep your queries on separate sheets of paper when corresponding about such matters as patents, subscriptions, books, etc. This will greatly facilitate answering your questions, as in many cases they have to be referred to experts. The full name and address should be given on every sheet. No attention will be paid to unsigned queries. Full hints to correspondents are printed from time to time and will be mailed on request.

(12798) H. M. S. asks: A sketch intended to represent a voltaic cell is sent. This sketch was taken from the notebook of a high-school chemistry pupil, who copied it from the blackboard. I have no definite information as to what explanation the teacher gave in connection with it, but he evidently taught that the poles are charged with one kind of electricity below the surface of the liquid, and with the opposite sign above the electrolyte. Is this correct? If not, can you explain how the error arose? A. The sketch of a voltaic cell which you send, gives the old idea. Carhart's "Primary Batteries," published in 1891, on page 15 gives the sketch as you show it. Carhart's "College Physics," published in 1910, gives the accepted theory of ionization and the travel of ions to account for the potential set up in a cell. We send the book for \$2.50 postpaid. If sulphuric acid is the electrolyte, positive hydrogen ions are constantly traveling to the copper plate, and negative sulphurions toward the zinc plate, where they take away zinc to form zinc sulphate, and the zinc becomes negatively charged, both within and without the liquid. The hydrogen ions give up their positive charge to the copper, become hydrogen gas, and rise out of the cell, or else polarize it, unless otherwise disposed of. The only suggestion we can make to account for the use of this old theory is that the teacher of chemistry who used it had not kept up with the advance in theory in his own subject. Perhaps he had too many subjects to teach, and was overloaded. There are many such in high schools who should be pitied rather than blamed.

(12799) R. G. asks: 1. I should like to know if you can tell me if there is any known substance that will carry a current of magnetism, but will resist a current of electricity? A. Magnetism acts by what we call lines of force, and these pass from one pole of a magnet through the air or other material to the other pole. All substances allow these lines to pass through them, with about the same ease, excepting iron, which allows them to pass with greater ease than do other substances. There is no current of magnetism, in the same sense as there is a current of electricity. 2. Will lodestone conduct an electric current? Does a piece of lodestone have north and south poles, the same as any other permanent magnet? A. Lodestone is an oxide of iron and is not a conductor of electricity. A lodestone has a north and a south pole like any other magnet, and if it is hung up so that it can swing, it will come to rest with its poles in the north and south line.

(12800) W. H. K. asks: Can a building, having a tin roof with a spout entering the ground, be struck by lightning? A. A building having a tin roof well grounded can be struck by lightning just as any building not protected at all may be, but it is not so likely to be injured by lightning. You would do well to get the Farmer's Bulletin No. 367, "Lightning and Lightning Conductors," and see the most sensible method of protecting buildings which we have seen. We think the price is fifteen cents in coin or postal order, sent to the Superintendent of Documents, Government Printing Office, Washington, D. C. This document discusses the protection of buildings with metallic roofs.

(12801) T. J. L. asks: If a steam whistle of a certain pitch be moving from a hearer at a high velocity, the sound will be heard in a lower pitch than if both whistle and hearer were stationary; in fact, if the whistle were moving from the hearer at something near the velocity of sound, it could not be heard at all. Would not the same be true of light? Heat and light being solar energy of different wave length, it seems to me that if a luminous body, say a star, be moving toward us at an enormous velocity or from us at the same velocity, the heat waves might become light waves and the light waves heat waves; that is, to the observer. Could this explain the phenomenon of the "variable star"? Such a motion would be possible if the orbit of the star were seen, so to speak, from the edge. I don't know whether so high a velocity could be possible. A. The principle which you state as applying to sound emitted by a moving body is called "Doppler's principle," and applies to light from a moving source of light in the same manner as it does to sound. By measurements with the spectroscope it is possible to determine the velocity of motion of stars toward or from the earth or of the opposite sides of the sun or a sun spot. You will find this matter discussed in textbooks of astronomy. We can furnish you with Young's "Manual of Astronomy" for \$2.50. No body has been found with a velocity anywhere approaching the speed of light. Heat waves would become light waves if sufficiently accelerated. The relative velocities of double stars have been determined by this method, even when the separate components can not be seen with the highest powers of the telescope. These are called spectroscopic binaries.

(12802) C. E. D. asks: In your Notes and Queries, 12760, you say that gravitation differs from other great forces of nature, and "acts instantly, not flowing with a velocity which would require time for it to cover a space." This I am unable to square with my reason. If gravitation does not require time, then its speed, which you term "instantly," must be infinite, and any force multiplied by an infinite speed becomes irresist-

ble. It seems to me much more probable that gravitation has a speed just as light or electricity, but we simply have not found a means of measuring it. Light, for example, acts instantaneously so far as most of us are concerned, but we know that it has a speed and is not instantaneous. Why should we assume that gravitation is otherwise? Much more could be said on this subject, but I will be pleased to hear your reply to the above. A. The inference that gravitation acts instantaneously between the earth and the sun is based upon a simple fact that the force between the earth and the sun which we call gravitation is directed from the center of the earth to the center of the sun. If the speed of gravitation were that of light, for example, the earth at a speed of 19 miles a second would travel over more than its own diameter before the attraction would reach it and would be farther from the sun than it was when the force started from the sun. The earth would under this hypothesis soon escape from the sun's control. On this point we quote the Encyclopedia Britannica, under the word "Gravitation," vol. xii, page 384b: "The question has also been raised whether the action of gravitation is absolutely instantaneous. If not, the action would not be exactly in the line adjoining the two bodies at the instant, but would be affected by the motion of the line joining them during the time required by the force to pass from one body to the other. The result of this would be seen in the motions of the planets around the sun; but the most refined observation shows no such effect." We think we may rest upon this authority. At any rate, all astronomers consider that gravitation acts across the spaces instantaneously. We may add that gravitation gives no evidence whatever that it is a wave motion as light is, nor does it give any indication whatever as to its intrinsic nature. It is one of the deepest of mysteries.

(12803) A. D. H. asks: By electrically welding two pieces of steel wire together, it is claimed that the wire is injured at the joint. Does this electric welding process have a tendency to harden the steel, burn the wire or make it brittle at the joint, or injure the wire at the joint in any way? Why do the wires break more easily at the joint? A. To weld a piano wire with electricity, it is necessary to heat the wire till it is very soft. This will certainly draw the temper. It will also burn out some of the carbon and greatly reduce the quality of the steel. Both changes will weaken the wire.

(12804) C. L. J. writes: From observations on numbers of cables in different parts of the world, I have found the greater the angle of direction from north and south, the greater have been the "earth currents" in them. The E.M.F. of the currents varies considerably, averaging generally 2 or 3 volts in cables running east and west. On one occasion, some years ago, between India and the Malay Peninsula, the E.M.F. measured nearly 100 volts, but this was exceptional and due to magnetic disturbances in the atmosphere. I have never seen it advanced in any textbook, but it has been my opinion that the compass simply follows the well-known fact that a magnetized needle places itself at right angles to any electrical current in its neighborhood and does not obtain its direction from its attraction by what we know as magnetism. I am also of opinion that a magnetized needle or compass would not point directly to the earth, as you state, and at the true magnetic pole it would have no definite direction. A. Those interested in the subject of "earth currents" will find quite an elaborate article upon them in the Ency. Brit., eleventh edition, vol. viii, pages 813-816. It gives also a bibliography of the subject, although this is not at all complete. There seems to be no doubt that the earth currents are connected with the earth's magnetism, but it can hardly be decided as yet which is cause and which is effect. The maximum voltage observed was in 1859, when as high as 700 to 800 volts were found on telegraph lines 300 to 375 miles long. Earth current voltages as high as half a volt per mile have since been found; but these are exceptional. They appear to be connected with sunspots and magnetic storms. They may well be believed to cause the magnetic lines of the earth to which the needle of the compass places itself parallel. Every wire carrying a current of electricity is surrounded by whirls of magnetic lines of force, and the compass needle places itself parallel to these, thus taking its position across the wire, but the needle is thought of as following the lines of force and not as standing across the current of electricity. The behavior of the dipping needle follows the same rule. A well-balanced needle is hung upon a horizontal axis. If magnetized and placed in a north and south line, with its axis east and west, it will come to rest in the northern hemisphere with its north pole below the horizontal and the south pole raised. In New York the dip is about 70 degrees. Over the magnetic pole the dip is 90 degrees, that is, the dipping needle stands vertically, or straight up and down. It is in this way that the magnetic poles are located, and we have no other means of locating them. The dip needle places itself tangent to the lines of force in the place where it is. An ordinary compass with a needle swinging horizontally will not indicate the magnetic pole, because it will over the pole have no directive force at all, and will point indifferently in any direction.

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# Are These Things There?

By R. E. Olds, Designer

In buying a car in 1913 here are some things to look for. By them judge how the car is built, how up-to-date it is.

And judge by them if the maker gives you the very best he knows.

## Outer Features

Note if the car has left-side drive, like the leading cars today. Does the driver sit close to the cars he passes, or on the farther side?

Has the car electric set-in dash lights, or the old, projecting lamps?

Is it under-tired or over-tired? That makes an enormous difference in your tire upkeep.

Is one front door blocked up by levers? Or do levers block the passage between the two front seats? If so, the driver half the time must enter from the street.

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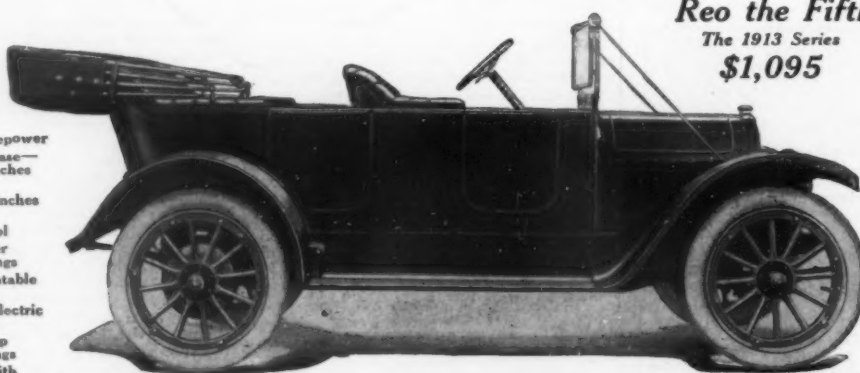
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